

# Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

PMRA Submission Number {.....}

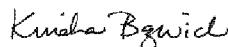
EPA MRID Number 50958205

**Data Requirement:** PMRA Data Code: 9.8.4 (TGAI) or 9.8.6 (EP)  
EPA DP Barcode: N/A  
OECD Data Point: IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)  
MRID: 50958205  
EPA Guideline: 850.4150

**Test material:** Clarity® formulation (a.i. Dicamba DGA salt) Purity: 40.2% a.e. (w/w); 485 g/L  
Roundup PowerMax® formulation (a.i. Glyphosate potassium salt) Purity: 38.9% a.e. (w/w); 527 g/L

Common name: Dicamba DGA and Glyphosate acid  
Chemical name: IUPAC: 3,6-Dichloro-o-anisic acid-2-(2-aminoethoxy)ethanol (Dicamba DGA)  
N-(phosphonomethyl)glycine (Glyphosate)  
CAS name: 2-(2-Aminoethoxy)ethanol;3,6-dichloro-2-methoxy-benzoic acid (Dicamba DGA)  
N-(phosphonomethyl)glycine (Glyphosate)  
CAS No.: 104040-79-1 (Dicamba DGA salt)  
70901-12-1 (Glyphosate potassium salt)  
Synonyms: Diglycolamine salt of 3,6-dichloro-o-anisic acid

**Primary Reviewer:** Kindra Bozicevich  
Senior Scientist, CDM/CSS-Dynamac JV

  
**Signature:** *Kindra Bozicevich*  
**Date:** 3/17/20

**Secondary Reviewer:** Teresa Nelis  
Senior Scientist, CDM/CSS-Dynamac JV

  
**Signature:** *Teresa Nelis*  
**Date:** 3/31/20

**Primary Reviewer:** Frank T. Farruggia, Ph.D.  
Senior Scientist, EPA/OPP/EFED/ERB-1

  
**Date:** 9/2/20   
2020.10.25 12:48:18  
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**Secondary Reviewer(s):** {.....}  
{EPA/OECD/PMRA}

**Date:** {.....}

This Data Evaluation Record may have been altered by the Environmental Fate and Effects Division subsequent to signing by CDM/CSS-Dynamac JV personnel. The CDM/CSS-Dynamac Joint Venture role does not include establishing Agency policies.

Reference/Submission No.: {.....}

**Company Code:** {.....} [For PMRA]  
**Active Code:** {.....} [For PMRA]  
**Use Site Category:** {.....} [For PMRA]  
**EPA PC Code:** 128931 (Dicamba DGA salt)

Date Evaluation Completed: 02-09-2020

**CITATION:** Jones, G.L., S. Castro-Tanzi, S. Whiting, and T. Wiepke. 2020. Dicamba. Potential Effects of Clarity® (dicamba) Tank-Mixed with Roundup PowerMax® (glyphosate) on Non-Tolerant Dicamba/Glyphosate Tolerant Soybeans when Applied at Low Application Rates in the Field- Northeast Mississippi. Final Report. Unpublished study performed by Stone Environmental, Inc., Montpelier, Vermont, Eurofins EAG Agroscience, LLC, Columbia, Missouri, and Stewart Ag Research Farm Inc., Clarence, Missouri. Stone Study No.: Stone 19-083. Eurofins EAG Report No.: 89602. Task No.: TK0457677. Study sponsored by Syngenta Crop Protection, LLC, Greensboro, North Carolina. Study initiated June 17, 2019 and completed January 9, 2020.

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## EXECUTIVE SUMMARY:

The effect of Clarity® formulation (a.i. Dicamba DGA salt) + Roundup PowerMax® formulation (a.i. Glyphosate potassium salt) + Adjuvant Intact™ on the vegetative vigor of dicot (dicamba non-tolerant/glyphosate-tolerant soybean, *Glycine max*; var. Beck's 4268FP) crops was studied in a soybean yield study. Nominal concentrations ranged from 0.00030 to 0.0048 lb ae dicamba/A and 0.00068 to 0.011 lb ae glyphosate/A in the spray tank solution. The test concentrations of dicamba and glyphosate were analytically confirmed at all treatment levels, and nominal and measured application rates are provided in Table 3.

The study was conducted in a field located in northeast Missouri (silt loam, pH 5.6, organic matter 2.5%).

The study targeted application during two developmental growth stages, early vegetative growth stage (V3) and flowering reproductive stage (R1). The treatment field was divided into two equal fields with 24 replicate plots for each test; non-dicamba tolerant soybeans were planted on July 1, 2019. The test solutions were applied to the respective field on July 22, 2019 and August 7, 2019 for the vegetative growth test and the reproductive test, respectively. On 14 and 29 days after treatment (DAT) for the vegetative growth stage test and 14 and 28 DAT for the reproductive test, soybean plants were measured for height and assessed for visual morphology. On November 6, 2020 (107 DAT for the vegetative growth test and 92 DAT for the reproductive test), soybean plants were harvested for determination of yield for both studies.

Dry weight and survival were not tested in either of the two tests.

Comparisons across the IC<sub>25</sub> estimates suggests similar response levels for plant height across vegetative and reproductive phase exposures and observation periods (14DAT or 28DAT). The most sensitive endpoint was based on 28DAT height in the reproductive stage, with NOAEC and IC<sub>25</sub> values of <0.00028 and 0.00014 lb ae/A dicamba, respectively.

The most sensitive dicot was soybean, based on height in the reproductive stage, with a NOAEC and an IC<sub>25</sub> value of <0.00028 and 0.00136 lb ae/A Dicamba, respectively,

Reported visual signs of injury (VSI) included leaf cupping, epinasty of both stems and petioles, and some stunting and were readily apparent and significant (>12%) at all application rates the vegetative growth and reproductive stage study. VSI was evaluated using logistic regression in Excel fit to observed VSI for each test dose. No hypothesis testing was evaluated to establish NOAEC/LOAEC endpoints. Regression equations provided in Figures 3 and 4 were used to estimate the %VSI for regression based IC<sub>x</sub> values for plant height and yield. Table 1b provides the observed (NOAECs) and estimated (IC<sub>x</sub>) average %VSI for each height and yield endpoint for 14DAT and 28DAT.

## **Results Synopsis**

A summary of the endpoints for height and yield are provided for dicamba (Table 1a) and glyphosate (Table 1c). Also provided in Figures 1a & 1b are the response relationships between height, VSI, yield, test concentration and evaluation time step. The average %VSI for each height and yield endpoint is provided in Table 1b. This study is scientifically sound and is classified as supplemental.

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**Table 1a. Summary of most sensitive parameters (lb ac/A Dicamba).**

Species	Stage	Endpoint	NOAEC	EC <sub>05</sub> /IC <sub>05</sub>	EC <sub>25</sub> /IC <sub>25</sub>
Soybean	Vegetative Growth	14-DAT Height	0.00056	0.000849	0.00278
		28-DAT Height	0.0003	0.000428	0.00193
		Yield	0.0022	NC	>0.0045
	Reproductive	14-DAT Height	0.00056	0.000479	0.00211
		28-DAT Height <sup>1</sup>	<0.00028	0.000214	0.00136
		Yield	0.0048	NC	>0.0048

NC- Not calculable.

<sup>1</sup> Significant effects at all application rates, indicating lowest test concentration did not bracket effects at the lowest concentration range, and range of application rates was inadequate to accurately determine sensitivity to the test material.

**Table 1b. Summary of Estimated Average % VSI at Endpoint Concentrations provided in Table 1a. (%)**

Species	Stage	Endpoint*	NOAEC	EC <sub>05</sub> /IC <sub>05</sub>	EC <sub>25</sub> /IC <sub>25</sub>
Soybean	Vegetative Growth	VSI 14-DAT Height	30	33	45
		VSI 28-DAT Height	20	18	35
		VSI Yield <sup>a</sup>	43 (14DAT) 34 (28DAT)	NC	NC
	Reproductive	VSI 14-DAT Height	25	24	33
		VSI 28-DAT Height	21	37	42
		VSI Yield <sup>a</sup>	38 (14DAT) 44 (28DAT)	NC	NC

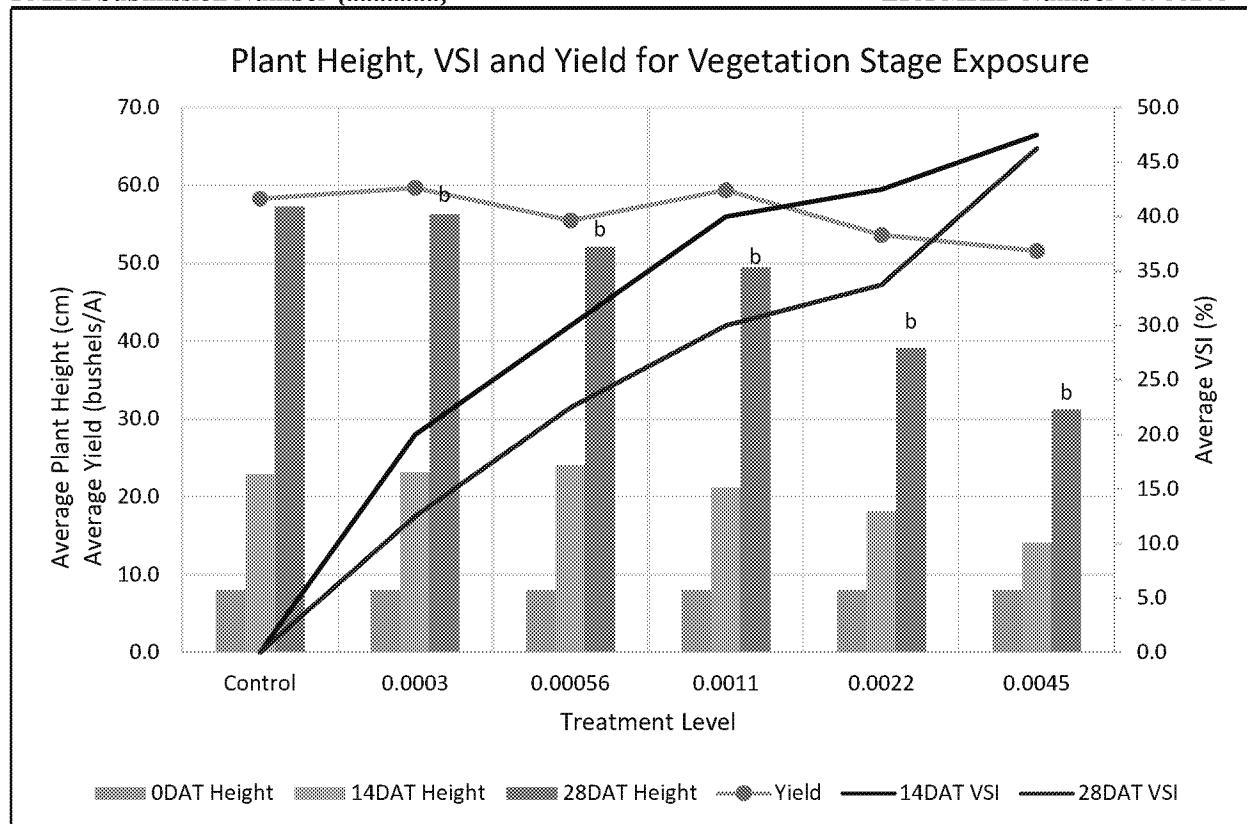
\* Endpoints in Table 1a were used to a) provide the observed VSI at the NOAEC, and b) estimate the %VSI at height and yield IC<sub>x</sub> endpoints using logistic regression equations fit to study reported VSI on 14-DAT and 28-DAT.

<sup>a</sup> VSI was not assessed at the time of harvest, therefore %VSI for Yield is presented as the observed or predicted %VSI at 14DAT and 28DAT for the Yield endpoints in Table 1a.

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**Figure 1: Relationship of plant height (Day 0, 14, 28), VSI (Day 14, 28) and yield (test termination) for the treatments applied during vegetative growth stages. Note: treatment levels with responses determined to be statistically different from the controls for day 14 height ("a"); day 28 height ("b"), and yield ("c") are indicated.**

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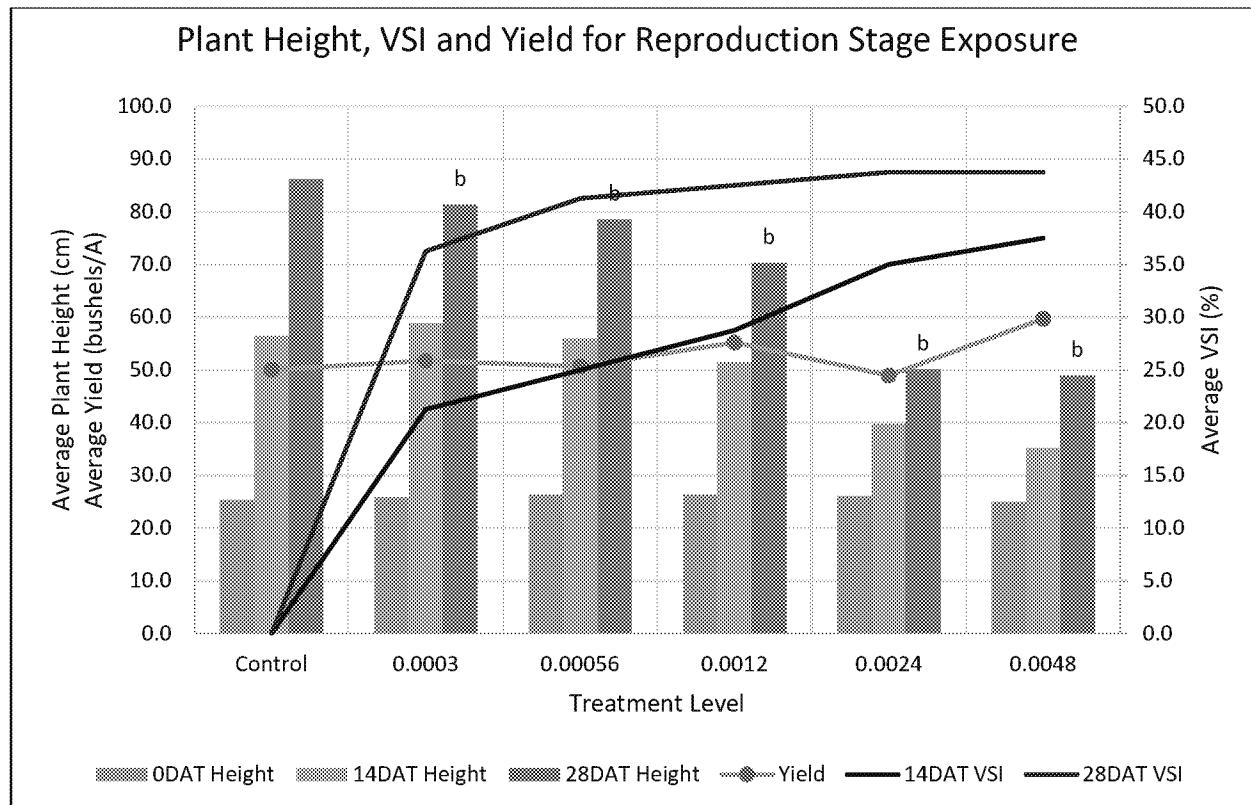


Figure 2: Relationship of plant height (Day 0, 14, 28), VSI (Day 14, 28) and yield (test termination) for the treatments applied during reproductive growth stages. Note: treatment levels with responses determined to be statistically different from the controls for day 14 height ("a"); day 28 height ("b"), and yield ("c") are indicated.

## I. MATERIALS AND METHODS

### GUIDELINE FOLLOWED:

This study was a non-guideline yield study. The reviewer evaluated the study methods according to OCSPP Guideline 850.4150: Vegetative Vigor. The following deviations were noted by the reviewer:

- For both the vegetative growth and reproductive portions of the study, the study author measured the height of five plants "selected non-systematically" within each row of the two center rows in each replicate plot for a total of 10 plants prior to treatment, 14 DAT and 28/29 DAT (p. 18).

OCSPP guidance recommends that the integrity of the replicate should be maintained throughout the duration of the study. In this study, plant height was determined for ten different plants at each measurement. The reviewer suggests that this sampling method is inadequate and introduces unnecessary variability into the study results that should have been more systematically controlled.

- Control plots were located so that "no control plot would be adjacent to a plot receiving the highest application rate" (pp. 10, 148). The study authors assume there is no potential for drift to the control plots from the other lower applications.

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Likewise, the vegetative growth test field and the reproductive test fields were adjacent and separated by at least 20 ft (6 m). The prevailing wind was from the south-southwest, indicating the vegetative growth plots were upwind of the reproductive test plots (Appendix 5, Figure 1, p. 296). The study authors assume there is no potential for drift to the vegetative growth plots from the reproductive study spray application on August 7, 2019.

3. The study author did not report inhibitions or NOAECs for height and yield data for the vegetative growth or reproductive study.
4. Survival of plants in each test plot was not determined. OCSPP guidance recommends measuring effects on survival as part of the vegetative vigor test.
5. “Soybeans will be harvested based on crop maturity relative to the plants in the control plots” (p. 154). The maturity of the soybean crop at time of harvest was not reported or described.
6. No supplemental irrigation was applied during the study.
7. Soil percent organic carbon was not reported.
8. The study author did not provide seed supplier information and historical germination rates for the soybean varieties planted.
9. Light intensity and humidity at the field test site were not determined. Daily observations of any moisture stress were also not reported.
10. Limits of detection (LOD) and quantification (LOQ) were not reported for HPLC-UV and UPLC-MS/MS analysis.
11. The physico-chemical properties of the test materials were not reported.
12. The Beck's 4268FP variety of soybean that was planted in the test plots for both the vegetative growth and reproductive study, is a non-Dicamba tolerant soybean. This variety was also selected because of its glyphosate-tolerance. It is uncertain if this genetically modified variety may have impacted dicamba effects compared to a non-genetically modified variety.
13. The study had a later than anticipated application date for the reproductive phase, it is unknown if this had contributed any confounding factors into the interpretation of the results.

The deficiency and deviations did have an impact on the acceptability of this study.

## COMPLIANCE:

Signed and dated Good Laboratory Practices (GLP), Quality Assurance, and No Data Confidentiality statements were provided. This study was conducted in compliance with U.S. EPA 40 CFR Part 160 with the following exceptions: climactic data not generated for GLP, soil moisture and temperature records not generated per GLP, and GPS coordinates, elevation estimates, slope estimates and field crop history not GLP.

## A. MATERIALS:

### 1. Test Material:

Clarity® formulation (a.i. Dicamba DGA salt)  
Roundup PowerMax® formulation (a.i. Glyphosate potassium salt)  
Intact drift reduction agent (<0.005% (v/v))

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Description:	Not reported	
Lot No./Batch No.:	A21638A (Batch I.D.) (Dicamba DGA salt) 934468 (Batch I.D.) (Glyphosate potassium salt)	
Purity:	40.2% a.e. (w/w); 485 g/L (Dicamba) 38.9% a.e. (w/w); 527 g/L (Glyphosate)	
Stability of compound under test conditions:	Measured concentration of the test material in the tank mix yielded recoveries of 92-99% (n = 10) for dicamba and 81-95% (n = 10) for glyphosate. Stability was not determined. <i>(OECD recommends chemical stability in water and light)</i>	
Storage conditions of test chemicals:	Storage intervals ranged from 22 to 48 days at temperatures from 68 to 76°F (20 to 24°C, required <30°C).	
<b>Table 2. Physical/chemical properties of Clarity® formulation (a.i. Dicamba DGA salt) + Roundup PowerMax® formulation (a.i. Glyphosate potassium salt)</b>		
Parameter	Values	Comments
Water solubility at 20°C	Not reported	
Vapor pressure	Not reported	
UV absorption	Not reported	
pKa	Not reported	
Kow	Not reported	

## 2. Test organism:

**Monocotyledonous species:** None.

*EPA recommends four monocots in two families, including corn.*

**Dicotyledonous species:** Soybean (*Glycine max*, Fabaceae; Beck's 4268FP (Dicamba non-tolerant/glyphosate-tolerant soybean)).

*EPA recommends six dicots in four families, including soybean and a root crop.*

*OECD recommends a minimum of three species selected for testing, at least one from each of the following categories: Category 1: ryegrass, rice, oat, wheat, and sorghum; Category 2: mustard, rape, radish, turnip, and Chinese cabbage; Category 3: vetch, mung bean, red clover, fenugreek, lettuce, and cress.*

**Seed source:** Not reported.

**Prior seed treatment/sterilization:** Not reported

**Historical % germination of seed:** Not reported.

**Seed storage, if any:** Not reported.

## B. STUDY DESIGN:

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## 1. Experimental Conditions

- a. Limit test: None.
- b. Range-finding study: None.
- c. Definitive Study

**Table 3. Nominal and Analytically Confirmed Test Application Rates (lb ae/A) for Soybean.<sup>1</sup>**

Nominal Rates		Analytically Confirmed Rates of Dicamba Adjusted for Measured Field Application Rates <sup>2</sup> (Percent of Nominal)	Analytically Confirmed Rates of Glyphosate Adjusted for Measured Field Application Rates <sup>2</sup> (Percent of Nominal)
as Dicamba	as Glyphosate	Vegetative Growth Stage	
0 (negative control)	0 (negative control)	0 <sup>3</sup>	0 <sup>3</sup>
0.00030	0.00068	0.00030 (98)	0.00060 (86)
0.00060	0.0013	0.00056 (94)	0.0011 (81)
0.0012	0.0027	0.0012 (99)	0.0024 (87)
0.0024	0.0054	0.0024 (98)	0.0047 (86)
0.0048	0.011	0.0048 (97)	0.010 (90)
		Reproductive Growth Stage	
0 (negative control)	0 (negative control)	0 <sup>3</sup>	0 <sup>3</sup>
0.00030	0.00068	0.00028 (92)	0.00058 (84)
0.00060	0.0013	0.00056 (94)	0.0011 (83)
0.0012	0.0027	0.0011 (95)	0.0024 (89)
0.0024	0.0054	0.0022 (92)	0.0049 (89)
0.0048	0.0024	0.0045 (95)	0.010 (95)

Data obtained from Tables 1-2, pp. 29-30; Tables 18-19, pp. 46-47; and Appendix 1, Tables 3-4, pp. 89-96 in the study report.

<sup>1</sup> Treatments were tank-mixes of dicamba (Clarity®), glyphosate (Roundup PowerMax®), and Intact™, a drift reduction agent. Measured tank-mix concentrations for dicamba were 94-99% and 92-95% of theoretical concentrations for the vegetative and reproductive experiments, respectively. Glyphosate concentrations were 81-90% and 83-95% of theoretical concentrations for the vegetative and reproductive experiments, respectively.

<sup>2</sup> Measured tank concentrations were adjusted for measured field application rates (% of target GPA), and recoveries shown are based on analytical recoveries and field application rate recoveries and are rounded rates (DER Attachment 1).

<sup>3</sup> Limit of quantitation (LOQ) and limit of detection (LOD) for the analytical were not reported

**Table 4: Experimental Parameters – Soybean Yield.**

Parameters	Soybean Yield	
	Details	Remarks
		Criteria
Duration of the test	28 days for each experiment	Plants were exposed at two different growth stages: early vegetative (V3) and reproductive at flowering (R1).

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		<p><i>Recommended test duration is 14-21 days.</i></p> <p><i>OECD recommends that the test be terminated no sooner than 14 days after 50 percent of the control seedlings have emerged</i></p>
Number of seeds/plants/species/replicate	Soybeans were planted at a population of <i>ca.</i> 105,000 plant/A (34,848 linear feet of row and 3 seeds per foot of row) on 15-inch row spacing.	<p><i>Ten seeds per replicate should be used.</i></p> <p><i>OECD recommends a minimum of five seeds planted in each replicate within 24 hours of incorporation of the test substance. All seeds of each species for each test should be of the same size class. The seed should not be imbibed.</i></p>
Number of plants retained after thinning	Thinning not reported.	
<u>Number of replicates</u> Control: Adjuvant control: Treated:	4 N/A 4	<p><i>Four replicates per dose should be used.</i></p> <p><i>OECD recommends a minimum of four replicates per treatment</i></p>
Number of test concentrations:	Five low dose tank-mix application (Treatments 1-5) and one negative control (Treatment 0; tank-mix water)	<p>Prepared in the day of application using a serial dilution, beginning with the highest rate and each subsequent mix being diluted by 50% of the previous volume.</p> <p><i>Five test concentrations should be used with a dose range of 2X or 3X progression</i></p> <p><i>OECD recommends three concentrations, preferably with application rates equivalent to 0.0 (control), 1.0, 10.0 and 100 mg substance per kg of oven-dried soil.</i></p>
<u>Method and interval of analytical verification</u>	Tank-mix samples were collected and analyzed for dicamba using HPLC with UV detection and glyphosate using UPLC-MS/MS detection.	
LOQ: LOD:	Not reported Not reported	
Adjuvant (type, percentage, if used)	Intact™ (Polyethylene glycol, choline chloride, guar gum), 0.5% v/v	

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<u>Test container (plot)</u>	Treatment field was 310 ft x 220 ft, and divided into two adjacent fields, 24 replicate plots each, for each growth test each.  Each treatment area was 22,500 ft <sup>2</sup> and was arranged as a randomized complete block (RCB) design. Each treated replicate subplot was <i>ca.</i> 10 ft x 20 ft (200 ft <sup>2</sup> ).  Soybeans were planted on 15-inch row spacing with the center eight rows (10 ft width) being treated.	Each experiment was separated from each other by a minimum of 20 ft, and the vegetative growth test field was separate from the reproductive test field by 20 ft.  No control plot was allowed to be adjacent to a plot receiving the highest application rate.
<u>Material:</u> (glass/polystyrene)	<i>Non-porous containers should be used.</i>  <i>OECD recommends that non-porous plastic or glazed pot be used.</i>	
Growth facility	Soybean field located in Perry, Missouri	
Method/depth of seeding	Soybeans were planted on July 1, 2019 for both experiments at <i>ca.</i> 105,000 plant/A (34,848 linear ft of row and 3 seeds per foot of row) on 15-inch row spacing.	Late planting was due to extremely wet planting conditions.  Crop was grown and maintained according to accepted local commercial practices, except that no synthetic auxin type herbicides were applied.
<u>Test material application</u> Application time including the plant growth stage	Early vegetative growth stage: V3 Flowering reproductive stage: R1	Applicates dates were 7/22/2019 for the vegetative growth stage and 8/7/2019 for the reproductive stage.
Number of applications	Single application	
Application interval	N/A- single application for each experiment	
Method of application	The test material was applied using a backpack sprayer (CO <sub>2</sub> propellant) with 6 TTI 110015 nozzles (35-45 PSI). Treatments were applied 20 inches above the canopy, resulting in an <i>ca.</i> 10-ft swath. Pass times were 6.25 sec to achieve an application rate of 18 gallons per acre (GPA).	

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<u>Details of soil used</u> Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC (meq/100 g) Moisture at 1/3 atm (%)	Perry, Missouri Not applicable Silt loam 14 64 22 5.6 Not reported 11.8 Not reported	Organic matter: 2.5% Bulk density disturbed: 1.10 gm/cc  <i>Soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter are preferable. Glass beads, rock wool, and 100% acid washed sand are not preferred.</i>  <i>OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.</i>
<u>Details of nutrient medium, if used</u>	Not applicable	
<u>Watering regime and schedules</u> Water source/type: Volume applied: Interval of application: Method of application:	None Not applicable Not applicable Not applicable	No supplemental irrigation was applied during the study.  Rainfall during study is presented in Appendix 4, pp. 271-275; rainfall event >0.50 inches: 7/9/19: 0.59 in. 7/17/19: 1.15 in. 7/29/19: 0.87 in. 8/12/19: 1.39 in. 8/25/19: 0.55 in. 9/8/19: 0.86 in. 9/29/19: 0.91 in. 10/10/19: 0.72 in. 10/21/19: 0.77 in. 10/30/19: 1.03 in.  Rainfall Total 7/22/2019-11/6/2019: 12.77 in.
Any pest control method/fertilization, if used	<u>Herbicides</u> 2018: Cinch ATZ (2.5 qt/A Form) and Instigate (6.0 fl oz/A Form)  2019: Liberty (40 fl oz/A Form), Cloak EX 29.5 G (0.8 oz Form), Anthem Maxx (3 fl oz (0.117)/A Form)  <u>Fertilizers</u> 2019: 0-0-62 (150 lb/A) and 11-52-0 (100 lb/A)	<i>EPA prefers that bottom watering be utilized for seedling emergence studies so that the chemical is not leached out of the soil during the test.</i>

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<u>Test conditions</u> Temperature:	Vegetative growth stage: Mean 84.4°F Reproductive stage: Mean 85.6°F  Over study period: Mean Monthly Max Range: 64.7-87.1°F Mean Monthly Min Range: 40.7-67.9°F	10% cloud cover for vegetative growth stage and 98% cloud cover for reproductive stage.  Temperature over study period excludes November, which has no means reported.
Photoperiod:	Not applicable; the study was conducted outside.	<i>EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth.</i> <i>OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.</i>
Light intensity and quality:	Not measured	
Relative humidity:	Not applicable	
<u>Reference chemical (if used)</u> Name: Concentrations: Other parameters, if any	N/A	
Other parameters, if any	None	

**2. Observations:**

**Table 5: Observation Parameters – Soybean Yield.**

Parameters	Vegetative Vigor	
	Details	Remarks
Parameters measured (e.g., number of germinated seeds, emerged seedlings, plant height, fresh weight or other endpoints)	Plant height Yield Visual Morphology	
Measurement technique for each parameter	Plant height was measured for 5 randomly selected plants from within each row of the 2 center rows in the treated areas of each plot for a total of 10 plants. A tape measure, ruler, or similar device was used to measure from the soil surface to the tip of the newest emerging apical bud (leaf) of the main stem.  Morphology was visually determined.	Plots were harvested using a MF#8 small plot combine. Harvest beans were weighed with a Harvest Master weighing system. All plots were harvested on November 6, 2019 using a MF #8 small plot combine. Yield was calculated using a calibrated Harvest Master H2 Classic Grainage system controlled through a touch pad and factory supplied weights (p. 20).

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	<p>Yield was calculated based on the actual weight of soybeans at harvest from the treated center eight rows (200 ft<sup>2</sup>). The means from each treated replicate plot were converted to lbs/acre by multiplying by 217.8, the number of replicate plots per acre. The lbs/acre was converted to the standard bushels per acre using 60 lb/bushel at 13% moisture.</p>	<p>Following harvest, beans were destroyed by mowing (bush hogged), followed by disking.</p>
Observation intervals	<p>Plant height and visual morphology were assessed for each treatment on the day of treatment (Day 0), or up to one day before treatment (Day -1), and at Days 14 and 28 or 29.</p>	
Other observations, if any	N/A	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	<p>Visual Plant Injury Rating Scale Adapted from Frans and Talbert, 1977: 0- no effect to 100- complete effect (dead plant), see p. 155.</p>	

**II. RESULTS and DISCUSSION:**

**A. INHIBITORY EFFECTS:**

Survival during the study was not determined by the study author and therefore could not be analyzed by the reviewer.

**Table 6a: Percent Inhibition of Survival- Vegetative Growth Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	ND
0.00060	0.0014	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.011	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00030, 0.00056, 0.0012, 0.0024, and 0.0048 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00060, 0.0011, 0.0024, 0.0047, and 0.010 lb ae/A.

# Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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**Table 6b: Percent Inhibition of Survival - Reproductive Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	ND
0.00060	0.0014	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.011	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00028, 0.00056, 0.0011, 0.0022, and 0.0045 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00058, 0.0011, 0.0024, 0.0049, and 0.010 lb ae/A.

When compared to the negative control, the reviewer found significant inhibitions in soybean plant height for both the vegetative growth and reproductive stages (Tables 6c and 6d). For the vegetative growth stage, significant inhibitions in soybean height were found at 0.00060 lb ae dicamba/A and 0.0014 lb ae glyphosate/A and higher, compared to the negative control (Jonckheere-Terpstra Step-Down test, p<0.05). For the reproductive stage, significant inhibitions in soybean height were found at 0.00030 lb ae dicamba/A and 0.00068 lb ae glyphosate/A, the lowest test concentration, and higher, compared to the negative control (Jonckheere-Terpstra Step-Down test, p<0.05).

The study author did not report inhibitions in height or NOAEC values, but provided qualitative results identifying treatment levels with significant inhibitions. Based on the study author's results, the study author found significant inhibitions in soybean height for the reproductive stage at all levels except the 0.00030 and 0.00060 lb ae/A levels (Dunnett's test, p<0.05), whereas the reviewer found significant inhibitions at all treatment levels. Study author results for height for the vegetative growth study were similar to reviewer results.

**Table 6c: Percent Inhibition of Plant Height- Vegetative Growth Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	2
0.00060	0.0014	8*
0.0012	0.0027	14*
0.0024	0.0054	32*
0.0048	0.011	45*

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00030, 0.00056, 0.0012, 0.0024, and 0.0048 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00060, 0.0011, 0.0024, 0.0047, and 0.010 lb ae/A.

\* Statistically significant when compared to the negative control.

# Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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**Table 6d: Percent Inhibition of Plant Height- Reproductive Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	6 <sup>4*</sup>
0.00060	0.0014	9 <sup>4*</sup>
0.0012	0.0027	18 <sup>4*</sup>
0.0024	0.0054	42 <sup>4*</sup>
0.0048	0.011	43 <sup>4*</sup>

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00028, 0.00056, 0.0011, 0.0022, and 0.0045 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00058, 0.0011, 0.0024, 0.0049, and 0.010 lb ae/A.

<sup>4</sup> The study author did not consider percent inhibitions at these treatment levels as statistically significant.

\* Statistically significant when compared to the negative control.

When compared to the negative control, the reviewer found no significant inhibitions in soybean yield for both the vegetative growth and reproductive stages (Tables 6e and 6f). Results reported by the study author were in complete agreement with those of the reviewer.

**Table 6e: Percent Inhibition of Plant Yield- Vegetative Growth Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	-2
0.00060	0.0014	5
0.0012	0.0027	-2
0.0024	0.0054	8
0.0048	0.011	11

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00030, 0.00056, 0.0012, 0.0024, and 0.0048 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00060, 0.0011, 0.0024, 0.0047, and 0.010 lb ae/A.

**Table 6f: Percent Inhibition of Plant Yield- Reproductive Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	-3
0.00060	0.0014	-1
0.0012	0.0027	-10
0.0024	0.0054	2
0.0048	0.011	-19

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00028, 0.00056, 0.0011, 0.0022, and 0.0045 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00058, 0.0011, 0.0024, 0.0049, and 0.010 lb ae/A.

Dry weight during the study was not determined by the study author and therefore could not be analyzed by the reviewer.

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**Table 6g: Percent Inhibition of Dry Weight - Vegetative Growth Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	ND
0.00060	0.0014	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.011	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00030, 0.00056, 0.0012, 0.0024, and 0.0048 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00060, 0.0011, 0.0024, 0.0047, and 0.010 lb ae/A.

**Table 6h: Percent Inhibition of Dry Weight - Reproductive Stage.**

Nominal Rate lb ae/A		Percent Inhibition <sup>1</sup>
Clarity® (a.i. Dicamba) <sup>2</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>3</sup>	Soybean
0.00030	0.00068	ND
0.00060	0.0014	ND
0.0012	0.0027	ND
0.0024	0.0054	ND
0.0048	0.011	ND

ND – not determined; no data were collected as this endpoint was not analyzed.

<sup>1</sup> Treatment groups compared to the negative control

<sup>2</sup> The measured, adjusted for field application rates were 0.00028, 0.00056, 0.0011, 0.0022, and 0.0045 lb ae/A.

<sup>3</sup> The measured, adjusted for field application rates were 0.00058, 0.0011, 0.0024, 0.0049, and 0.010 lb ae/A.

The most sensitive dicot was soybean, based on height in the reproductive stage, with a NOAEC and an IC<sub>25</sub> value of <0.00028 and 0.00136 lb ae/A Dicamba, respectively (corresponding to a NOAEC and IC<sub>25</sub> of <0.00058 and 0.00295 lb ae/A glyphosate, respectively). Significant effects were observed at all application rates, and the IC<sub>05</sub>, IC<sub>50</sub>, and/or corresponding 95% confidence intervals were outside of the range of tested concentrations; therefore, soybean results should be interpreted with caution.

The phytotoxic symptoms noted included leaf cupping and leaf wrinkling and were found at moderate levels in soybean plants in both the vegetative growth study and the reproductive study. Phytotoxic symptoms showed a dose-dependent response in both studies.

## B. REPORTED STATISTICS:

To prepare the data for statistical analyses, a blocking factor variable was created by extracting the first number of the treatment plot, which resulted in all records being assigned to one of five grouping blocks. Each grouping block effectively contains 6 plots, one for each level of the application rate. This procedure was performed to account for the randomized block design of the experimental plot in the field trials.

For each experiment, a concentration-response model was used to estimate an EC<sub>25</sub> for plant height and yield if the overall test for a variable and time-point was significant ( $\alpha=0.05$ ). Application Rate Curve Modeling analysis was conducted by transforming the dicamba application rate using log (dicamba application rate (lb

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ae/A) +0.0001). Bivariate plots with dicamba application rates and the crop response variable in the x and y axis, respectively, were evaluated and a logistic equation was fit to the data.

To compare differences in yield and mean plant height between treatments, an ordinary linear square regression (OLS) model was fitted to each crop stage. F-statistics and p-values were generated for each model using ANOVA. When ANOVA indicated statistically significant differences between the treatment levels ( $\alpha=0.05$ ) and goodness of fit indicators suggested that the model provided an adequate fit to the data, differences between the control and all treatment levels were evaluated using the Dunnett's test. Visual injury ratings were analysed using the Friedman's test. When significant differences between treatments were found, the Nemenyi test was used to conduct post-hoc, pairwise comparisons between the control plots and the different dicamba application rates. All statistical analyses were performed using R statistical software (R Core Team, 2019c).

**Table 7a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.**

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95%CI
Soybean	31-57	ND	NC	N/A	0.0020	ND	ND	ND	N/A	N/A

ND = Not determined. N/A = Not applicable.

**Table 7b: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Stage.**

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95% CI
Soybean	49-86	ND	NC	N/A	0.0015	ND	ND	ND	N/A	N/A

ND = Not determined. N/A = Not applicable.

**Table 7c: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.**

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95% CI
Soybean	3469-4014*	ND	NC	N/A	NC	N/A	NC	N/A	N/A	N/A

ND = Not determined. N/A = Not applicable. N/C = Not calculable.

\* Yield data were calculated accounting for percent soil moisture.

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**Table 7d: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Growth Stage.**

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95% CI
Soybean	3293-4016*	ND	NC	N/A	NC	N/A	NC	N/A	N/A	N/A

ND = Not determined. N/A = Not applicable. N/C = Not calculable.

\* Yield data were calculated accounting for percent soil moisture.

**Table 7e: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.**

Species	Results summary for survival (lb ae/A Dicamba)									
	%	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95% CI
Soybean	ND	ND	ND	N/A	ND	N/A	ND	N/A	N/A	N/A

ND = Not determined. N/A = Not applicable. N/C = Not calculable.

**Table 7f: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Growth Stage.**

Species	Results summary for survival (lb ae/A Dicamba)									
	%	NOAEC	EC <sub>05</sub>	95% CI	EC <sub>25</sub>	95% CI	EC <sub>50</sub>	95% CI	slope	95% CI
Soybean	ND	ND	ND	N/A	ND	N/A	ND	N/A	N/A	N/A

ND = Not determined. N/A = Not applicable. N/C = Not calculable.

\* Yield data were calculated accounting for percent soil moisture.

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<b>28-Day Mean Visual Injury Rating</b>			
Nominal Rate lb ae/A		Vegetative Growth Stage (%)	Reproductive Stage (%)
Clarity® (a.i. Dicamba) <sup>1</sup>	Roundup PowerMax® (a.i. Glyphosate) <sup>2</sup>		
0 (negative control)	0 (negative control)	0 ± 0.0	0 ± 0.0
0.00030	0.00068	13 ± 2.9	36 ± 2.5
0.00060	0.0014	23 ± 2.9	41 ± 4.8
0.0012	0.0027	30 ± 0.0	43 ± 2.9
0.0024	0.0054	34 ± 6.3*	44 ± 2.5*
0.0048	0.011	46 ± 2.5*	44 ± 2.5*

<sup>1</sup> The measured, adjusted for field application rates were 0.00030, 0.00056, 0.0012, 0.0024, and 0.0048 lb ae dicamba/A and 0.00060, 0.0011, 0.0024, 0.0047, and 0.010 lb ae glyphosate/A for the vegetative growth stage.

<sup>2</sup> The measured, adjusted for field application rates were 0.00028, 0.00056, 0.0011, 0.0022, and 0.0045 lb ae dicamba/A and 0.00058, 0.0011, 0.0024, 0.0049, and 0.010 lb ae glyphosate/A for the reproductive stage.

\* Reported by the study author to be significantly greater than the control, according to the Nemenyi test.

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## C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

All analyses were conducted comparing treated to the negative control. These analyses were conducted using CETIS version 1.9.5.3 with database backend settings implemented by EFED on 7/25/2017. Data for each endpoint were tested to determine if their distributions were normal and if their variances were homogeneous using Shapiro-Wilk's and Levene's tests, respectively. Data that satisfied these assumptions were subjected to Dunnett's and William's tests, and data that did not satisfy these assumptions were subjected to the non-parametric Mann-Whitney U and Jonckheere's tests. Nonlinear (height and yield) regression models were used to interpret EC/IC<sub>x</sub> values. Adjusted, measured concentrations were used for all statistical analyses. The results of 28DAT Plant Height, Yield and %VSI are provided in the tables below. The complete statistics evaluation and 14DAT results are provided in the CETIS output pages at the back of this DER.

**Table 8a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.**

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
Soybean	31.2-57.2	0.00030	0.000428	0.000289-0.000564	0.00193	0.00171-0.00216	0.00549	0.0047-0.00641	N/A	N/A
Results summary for height (lb ae/A Glyphosate)										
	height (cm)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
	31.2-57.2	0.00060	0.000801	0.000524-0.00108	0.00383	0.00337-0.00432	0.0113	0.00962-0.0134	N/A	N/A

N/A- Not applicable.

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**Table 8c: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Vegetative Growth Stage.**

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
Soybean	3470-4010	0.0048	0.00202	N/A-0.00421	0.0113	N/A-0.0502	NC	N/A	N/A	N/A
Results summary for yield (lb ae/A Glyphosate)										
	yield (kg/ha)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
	3470-4010	0.010	0.00399	N/A-0.00858	0.0247	N/A-0.118	NC	N/A	N/A	N/A

NC- Not calculable. N/A- Not applicable.

\*Endpoints and/or confidence intervals are outside tested range of concentrations and should be interpreted with caution.

**Data Evaluation Record on the Toxicity of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) to Terrestrial Vascular Plants: Soybean Yield**

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**Table 9a: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Stage.**

Species	Results summary for height (lb ae/A Dicamba)									
	height (cm)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
Soybean	49.2-86	<0.00028	0.000214	6.74E-05-0.000372	0.00136	0.00109-0.00168	0.00495	0.0037-0.00661	N/A	N/A
	Results summary for height (lb ae/A Glyphosate)									
	height (cm)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
	49.2-86	<0.00058	0.000437	0.00014-0.000764	0.00295	0.00234-0.00365	0.0111	0.0083-0.0149	N/A	N/A

**Table 9c: Effect of Clarity® (a.i. Dicamba DGA salt) + Roundup PowerMax® (a.i. Glyphosate potassium salt) on 28-Day Soybean Yield- Reproductive Stage.**

Species	Results summary for yield (lb ae/A Dicamba)									
	yield (kg/ha)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
Soybean	3290-4020	0.0045	>0.0045	N/A	>0.0045	N/A	>0.0045	N/A	N/A	N/A
	Results summary for yield (lb ae/A Glyphosate)									
	yield (kg/ha)	NOAEC	IC <sub>05</sub>	95% CI	IC <sub>25</sub>	95% CI	IC <sub>50</sub>	95% CI	slope	95% CI
	3290-4020	0.010	>0.010	N/A	>0.010	N/A	>0.010	N/A	N/A	N/A

NC- Not calculable. N/A- Not applicable.

# Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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## Evaluation of Visual Signs of Injury:

VSI was evaluated using logistic regression in Excel fit to observed VSI for each test dose. No hypothesis testing was evaluated to establish NOAEC/LOAEC endpoints. Regression equations provided in Figures 3 and 4 were used to estimate the %VSI for regression based IC<sub>x</sub> values for plant height and yield. See Table 1b in the executive summary for the results of these estimation procedures.

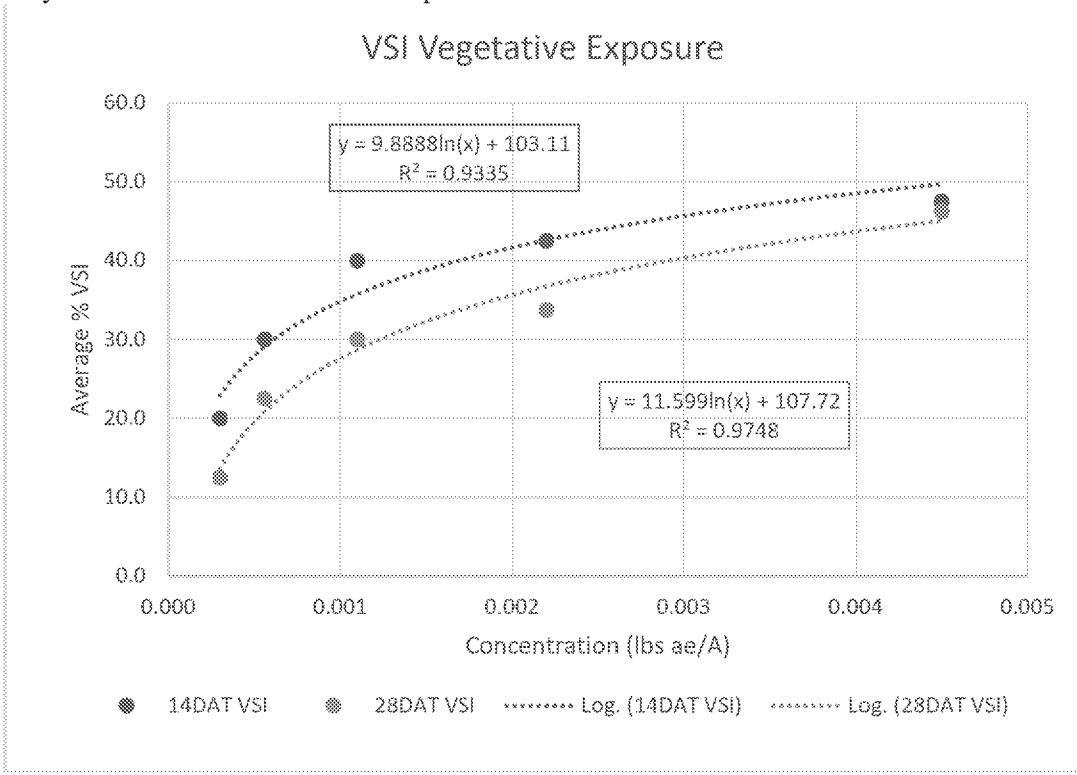


Figure 3. Logistic regression of %VSI for 14DAT and 28DAT observations of %VSI after a vegetative growth stage exposure.

## Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield

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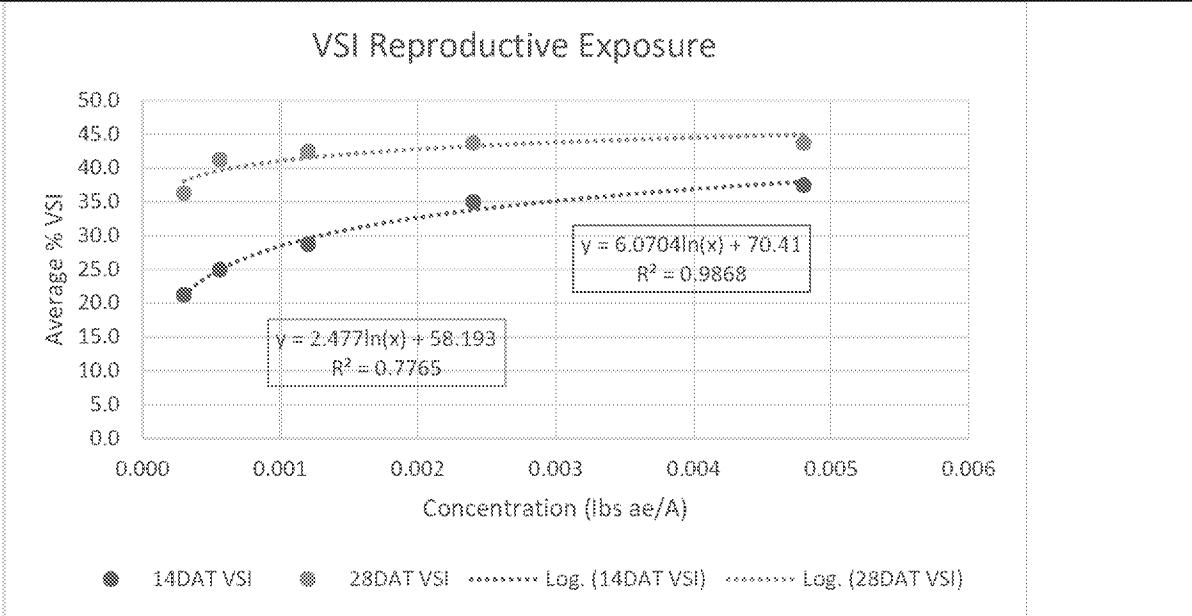


Figure 4. Logistic regression of %VSI for 14DAT and 28DAT observations of %VSI after a reproductive growth stage exposure.

### D. STUDY DEFICIENCIES:

See discussion provided above

### E. REVIEWER'S COMMENTS:

The reproductive stage with a NOAEC and EC<sub>25</sub> value for dicamba of <0.00028 and 0.00136 lb ae/A were the most sensitive measures of growth and reproduction overall (the study author did not report NOAEC values or endpoints in terms of glyphosate). Significant effects were observed at all application rates.

Differences between the study author and reviewer's results resulted from differences in statistical methods (hypothesis tests) and the study author analyzing nominal test concentrations while the reviewer analyzed measured test concentrations.

Application dates for the vegetative growth and reproductive stages were July 22, 2019 and August 7, 2019, respectively. The experimental completion date was November 6, 2019.

### F. CONCLUSIONS:

See executive summary for reviewer's conclusions.

This study is scientifically sound and is classified as supplemental.

**Data Evaluation Record on the Toxicity of Dicamba DGA salt and Glyphosate potassium salt to Terrestrial Vascular Plants: Soybean Yield**

**PMRA Submission Number {.....}**

**EPA MRID Number 50958205**

**III. REFERENCES:**

U.S. Environmental Protection Agency. 2012. Series 850-Ecological Effects Test Guidelines, OCSPP Number 850.4150: Vegetative Vigor.

**ATTACHMENT 1. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION**



128931\_50958205  
CETIS\_3-31-20.pdf

**ATTACHMENT 2. APPLICATION RATES, CONVERSIONS AND RAW DATA EXCEL FILE**



MRID%2050958205  
%2019-083%20Plant<sup>t</sup>

# CETIS Summary Report

Report Date: 31 Mar-20 14:50 (p 1 of 2)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Batch ID:	00-5163-0359	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	91d 0h	Taxon:		Source:	Age: R1
Sample ID:	21-0608-4805	Code:	50958205direpro	Project:	
Sample Date:	07 Aug-19	Material:	Dicamba DGA	Source:	Syngenta Crop Protection LLC
Receipt Date:		CAS (PC):		Station:	
Sample Age:	n/a	Client:	CDM Smith - K. Bozicevich		

128931 50958205; Soybean yield- Reproductive Stage (R1); Dicamba treatment

### Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
21-2043-1685	Height	Jonckheere-Terpstra Step-Down Test	✓ <0.00028	0.00028	n/a		n/a	1
05-6193-4802	Height	Mann-Whitney U Two-Sample Test	✓ <0.00028	0.00028	n/a		6.3%	1
00-4712-5726	Weight	Dunnett Multiple Comparison Test	0.0045	>0.0045	n/a		18.1%	1

### Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
14-0224-6022	Height	NLR: 3P Cum Log-Normal (Probit)	IC5	0.000214	6.74E-05	0.000372		1
			IC10	0.000428	0.000261	0.00062		
			IC25	0.00136	0.00109	0.00168		
			IC50	0.00495	0.0037	0.00661		

### Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	86	84.7	87.3	85	87	0.408	0.816	0.95%	0.00%
0.00028		4	81.2	77.1	85.4	79	84	1.31	2.63	3.24%	5.52%
0.00056		4	78.5	77.6	79.4	78	79	0.289	0.577	0.74%	8.72%
0.0011		4	70.2	64.2	76.3	66	75	1.89	3.77	5.37%	18.31%
0.0022		4	50.2	47.5	53	48	52	0.854	1.71	3.40%	41.57%
0.0045		4	49.2	36.1	62.4	43	61	4.13	8.26	16.77%	42.73%

### Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3370	2540	4200	2680	3940	261	522	15.50%	0.00%
0.00028		4	3480	2890	4070	3060	3800	185	370	10.63%	-3.43%
0.00056		4	3410	2850	3960	3010	3730	175	350	10.27%	-1.24%
0.0011		4	3710	3260	4170	3350	4050	142	284	7.66%	-10.35%
0.0022		4	3290	2980	3610	3010	3450	99.4	199	6.04%	2.17%
0.0045		4	4020	3470	4560	3620	4410	170	341	8.49%	-19.31%

**CETIS Summary Report**

Report Date: 31 Mar-20 14:50 (p 2 of 2)  
Test Code/ID: 50958205 direpr / 09-9715-6579

**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****Stone Environmental, Inc.****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	87	85	86	86
0.00028		79	84	83	79
0.00056		79	79	78	78
0.0011		75	66	71	69
0.0022		52	50	48	51
0.0045		49	61	44	43

**Weight Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3940	2680	3350	3500
0.00028		3280	3800	3790	3060
0.00056		3220	3730	3010	3670
0.0011		3350	3730	3720	4050
0.0022		3450	3310	3400	3010
0.0045		3620	4150	3890	4410

# CETIS Summary Report

Report Date: 31 Mar-20 14:53 (p 1 of 2)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Batch ID:	16-9482-9811	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	22 Jul-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	107d 0h	Taxon:		Source:	Age: V3
Sample ID:	18-8265-3946	Code:	50958205diveg	Project:	
Sample Date:	22 Jul-19	Material:	Dicamba DGA	Source:	Syngenta Crop Protection LLC
Receipt Date:		CAS (PC):		Station:	
Sample Age:	n/a	Client:	CDM Smith - K. Bozicevich		

128931 50958205; Soybean yield; Vegetative Growth Stage (V3)

### Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
13-0899-4996	Height	Jonckheere-Terpstra Step-Down Test	✓ 0.0003	0.00056	0.0004099		n/a	1
18-6768-4671	Height	Mann-Whitney U Two-Sample Test	✓ 0.0003	0.00056	0.0004099		4.94%	1
00-6050-6194	Weight	Dunnett Multiple Comparison Test	0.0048	>0.0048	n/a		13.4%	1

### Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
08-1125-6781	Height	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.000428	0.000289	0.000564		1
			✓ IC10	0.000752	0.000594	0.000916		
			✓ IC25	0.00193	0.00171	0.00216		
			✓ IC50	0.00549	0.0047	0.00641		
05-2601-7863	Weight	NLR: 3P Cum Log-Normal (Probit)	IC5	0.00202	n/a	0.00421		1
			IC10	0.00385	0.00171	0.00636		
			IC25	0.0113	n/a	0.0502		
			IC50	0.0372	n/a	n/a		

### Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	57.2	53.7	60.8	54	59	1.11	2.22	3.87%	0.00%
0.0003		4	56.2	53.5	59	54	58	0.854	1.71	3.04%	1.75%
0.00056		4	52.5	48.7	56.3	49	54	1.19	2.38	4.53%	8.30%
0.0012		4	49.5	46.5	52.5	47	51	0.957	1.91	3.87%	13.54%
0.0024		4	39	35.1	42.9	36	41	1.22	2.45	6.28%	31.88%
0.0048		4	31.2	28.9	33.6	30	33	0.75	1.5	4.80%	45.41%

### Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3920	3360	4480	3520	4370	176	351	8.95%	0.00%
0.0003		4	4010	3520	4510	3730	4360	157	313	7.81%	-2.36%
0.00056		4	3730	3510	3950	3550	3860	69.9	140	3.74%	4.82%
0.0012		4	4000	3490	4500	3750	4460	159	318	7.95%	-1.90%
0.0024		4	3610	3030	4180	3120	3920	181	362	10.03%	8.01%
0.0048		4	3470	2960	3980	3180	3810	160	319	9.20%	11.53%

**CETIS Summary Report**

Report Date: 31 Mar-20 14:53 (p 2 of 2)  
Test Code/ID: 50958205 diveg / 08-5996-9857

**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****Stone Environmental, Inc.****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	54	58	58	59
0.0003		56	54	58	57
0.00056		49	53	54	54
0.0012		51	47	51	49
0.0024		38	36	41	41
0.0048		32	33	30	30

**Weight Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	4370	3820	3520	3980
0.0003		4200	3770	4360	3730
0.00056		3860	3700	3820	3550
0.0012		3750	3850	3930	4460
0.0024		3120	3920	3850	3540
0.0048		3670	3220	3810	3180

# CETIS Analytical Report

Report Date: 31 Mar-20 14:49 (p 1 of 3)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID:	05-6193-4802	Endpoint:	Height	CETIS Version:	CETISv1.9.5			
Analyzed:	31 Mar-20 14:47	Analysis:	Nonparametric-Two Sample	Status Level:	1			
Batch ID:	00-5163-0359	Test Type:	Vegetative Vigor Tier II	Analyst:				
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:				
Test Length:	91d 0h	Taxon:		Source:	Age: R1			
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			<0.00028	0.00028	n/a		6.30%

### Mann-Whitney U Two-Sample Test

Control	vs	Control II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control		0.00028*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.00056*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0011*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0022*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0045*	16	n/a	0	6	Exact	0.0143	Significant Effect

### Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	3.37	2.8	0.0019	Outlier Detected

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	5088.5	1017.7	5	65.4	<1.0E-37	Significant Effect
Error	280	15.5556	18			
Total	5368.5		23			

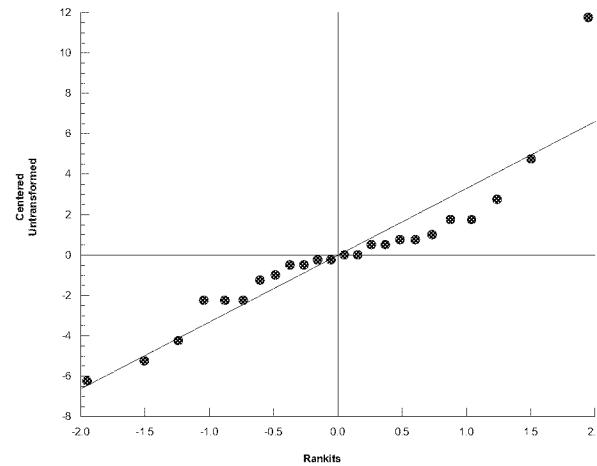
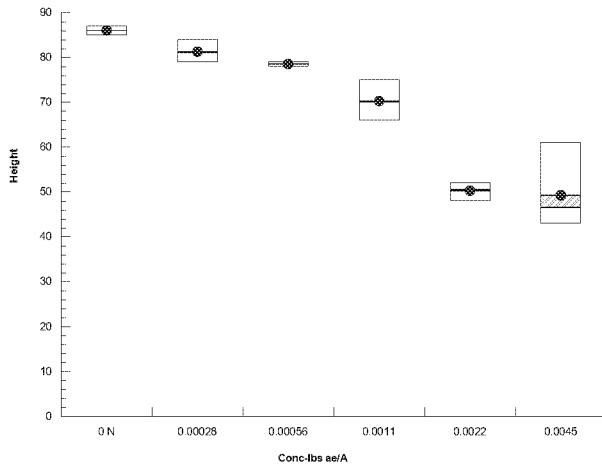
### ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	21.5	15.1	6.6E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.87	0.884	0.0052	Non-Normal Distribution

### Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	86	84.7	87.3	86	85	87	0.408	0.95%	0.00%
0.00028		4	81.2	77.1	85.4	81	79	84	1.31	3.24%	5.52%
0.00056		4	78.5	77.6	79.4	78.5	78	79	0.289	0.74%	8.72%
0.0011		4	70.2	64.2	76.3	70	66	75	1.89	5.37%	18.31%
0.0022		4	50.2	47.5	53	50.5	48	52	0.854	3.40%	41.57%
0.0045		4	49.2	36.1	62.4	46.5	43	61	4.13	16.77%	42.73%

### Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:49 (p 2 of 3)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID:	21-2043-1685	Endpoint:	Height	CETIS Version:	CETISv1.9.5
Analyzed:	31 Mar-20 14:48	Analysis:	Nonparametric-Control vs Ord. Treatments	Status Level:	1
Batch ID:	00-5163-0359	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	91d 0h	Taxon:		Source:	Age: R1

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	<0.00028	0.00028	n/a	

## Jonckheere-Terpstra Step-Down Test

Control	vs	Control II	Test Stat	Critical	Ties	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control		0.00028*	2.34	1.64	2	Asymp	0.0097	Significant Effect
		0.00056*	3.29	1.64	3	Asymp	4.9E-04	Significant Effect
		0.0011*	4.34	1.64	3	Asymp	7.2E-06	Significant Effect
		0.0022*	5.21	1.64	3	Asymp	<1.0E-37	Significant Effect
		0.0045*	5.72	1.64	3	Asymp	<1.0E-37	Significant Effect

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	3.37	2.8	0.0019	Outlier Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	5088.5	1017.7	5	65.4	<1.0E-37	Significant Effect
Error	280	15.5556	18			
Total	5368.5		23			

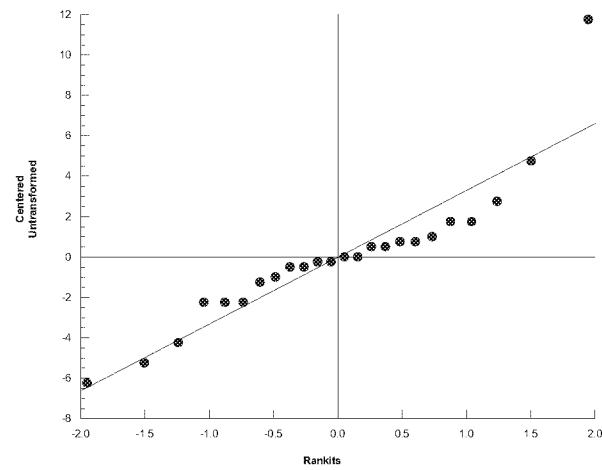
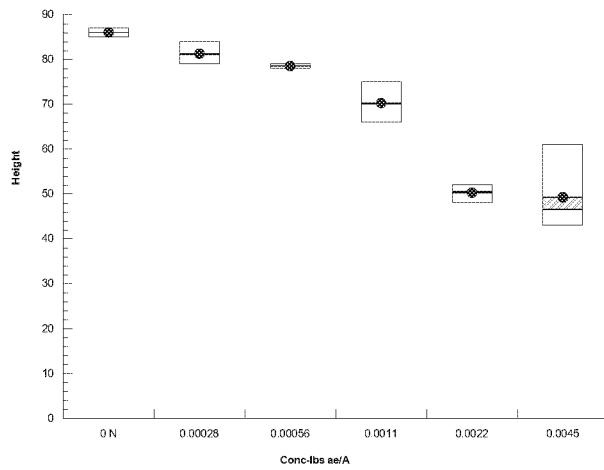
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	21.5	15.1	6.6E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.87	0.884	0.0052	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	86	84.7	87.3	86	85	87	0.408	0.95%	0.00%
0.00028		4	81.2	77.1	85.4	81	79	84	1.31	3.24%	5.52%
0.00056		4	78.5	77.6	79.4	78.5	78	79	0.289	0.74%	8.72%
0.0011		4	70.2	64.2	76.3	70	66	75	1.89	5.37%	18.31%
0.0022		4	50.2	47.5	53	50.5	48	52	0.854	3.40%	41.57%
0.0045		4	49.2	36.1	62.4	46.5	43	61	4.13	16.77%	42.73%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:49 (p 3 of 3)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.				
Analysis ID: 00-4712-5726	Endpoint: Weight			CETIS Version: CETISv1.9.5				
Analyzed: 31 Mar-20 14:48	Analysis: Parametric-Control vs Treatments			Status Level: 1				
Batch ID: 00-5163-0359	Test Type: Vegetative Vigor Tier II			Analyst:				
Start Date: 07 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:				
Ending Date: 06 Nov-19	Species: Glycine max			Brine:				
Test Length: 91d 0h	Taxon:			Source:	Age: R1			
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0045	>0.0045	n/a		18.10%

## Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision( $\alpha:5\%$ )
Negative Control	0.00028	-0.456	2.41	609	6	CDF	0.9334	Non-Significant Effect	
	0.00056	-0.165	2.41	609	6	CDF	0.8773	Non-Significant Effect	
	0.0011	-1.38	2.41	609	6	CDF	0.9940	Non-Significant Effect	
	0.0022	0.288	2.41	609	6	CDF	0.7347	Non-Significant Effect	
	0.0045	-2.57	2.41	609	6	CDF	0.9999	Non-Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.17	2.8	0.5472	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Between	1475560	295111	5	2.3	0.0876	Non-Significant Effect
Error	2305300	128072	18			
Total	3780860		23			

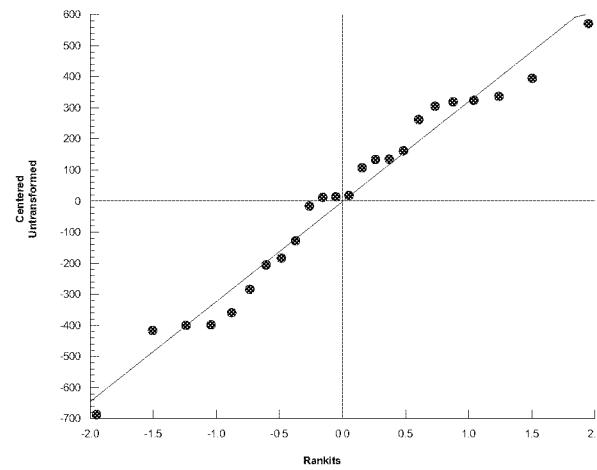
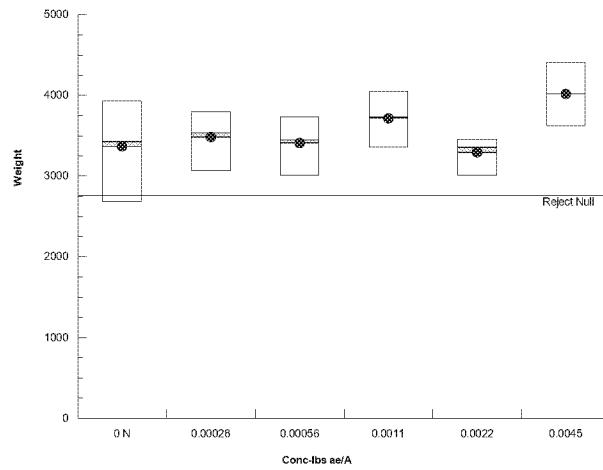
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:1\%$ )
Variance	Bartlett Equality of Variance Test	2.53	15.1	0.7715	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.97	0.884	0.6633	Normal Distribution

## Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	3370	2540	4200	3420	2680	3940	261	15.50%	0.00%
0.00028		4	3480	2890	4070	3530	3060	3800	185	10.63%	-3.43%
0.00056		4	3410	2850	3960	3450	3010	3730	175	10.27%	-1.24%
0.0011		4	3710	3260	4170	3730	3350	4050	142	7.66%	-10.35%
0.0022		4	3290	2980	3610	3350	3010	3450	99.4	6.04%	2.17%
0.0045		4	4020	3470	4560	4020	3620	4410	170	8.49%	-19.31%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:49 (p 1 of 2)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.
Analysis ID: 14-0224-6022	Endpoint: Height	CETIS Version: CETISv1.9.5		
Analyzed: 31 Mar-20 14:47	Analysis: Nonlinear Regression (NLR)	Status Level: 1		
Batch ID: 00-5163-0359	Test Type: Vegetative Vigor Tier II	Analyst:		
Start Date: 07 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor	Diluent:		
Ending Date: 06 Nov-19	Species: Glycine max	Brine:		
Test Length: 91d 0h	Taxon:	Source:	Age: R1	

## Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

## Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
7	-39.5	86.2	88.5	0.8738	6.16%	87	Yes	7.26	0.0022	Significant Lack of Fit

## Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000214	6.74E-05	0.000372
IC10	0.000428	0.000261	0.00062
IC25	0.00136	0.00109	0.00168
IC50	0.00495	0.0037	0.00661

## Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	87	2.58	81.6	92.3	33.8	<1.0E-37	Significant Parameter
$\gamma$	1.91	0.276	1.34	2.48	6.93	7.6E-07	Significant Parameter
$\delta$	0.00495	0.000718	0.00345	0.00644	6.89	8.3E-07	Significant Parameter

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	120000	39900	3	1360	<1.0E-37	Significant
Lack of Fit	339	113	3	7.26	0.0022	Significant
Pure Error	280	15.6	18			
Residual	619	29.5	21			

## Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	3.05	2.8	0.0146	Outlier Detected
Variance	Bartlett Equality of Variance Test	21.5	11.1	6.6E-04	Unequal Variances
	Mod Levene Equality of Variance	2.35	2.77	0.0828	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.701	2.49	0.0670	Normal Distribution
	Shapiro-Wilk W Normality Test	0.922	0.917	0.0655	Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	86	85	87	0.408	0.816	0.95%	0.0%
0.00028		4	81.2	79	84	1.31	2.63	3.24%	5.52%
0.00056		4	78.5	78	79	0.289	0.577	0.74%	8.72%
0.0011		4	70.2	66	75	1.89	3.77	5.37%	18.3%
0.0022		4	50.2	48	52	0.854	1.71	3.40%	41.6%
0.0045		4	49.2	43	61	4.13	8.26	16.80%	42.7%

# CETIS Analytical Report

Report Date: 31 Mar-20 14:49 (p 2 of 2)  
 Test Code/ID: 50958205 direpr / 09-9715-6579

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID: 14-0224-6022

Endpoint: Height

Analyzed: 31 Mar-20 14:47

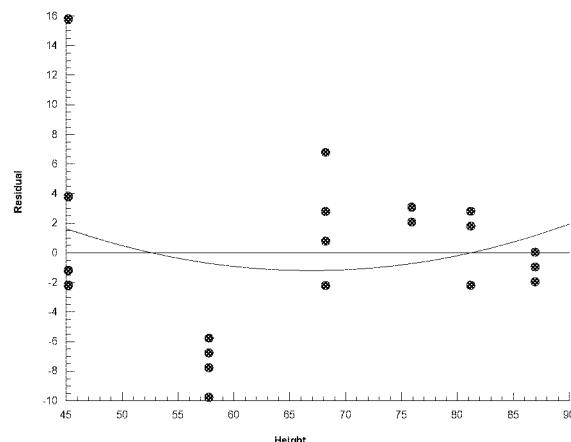
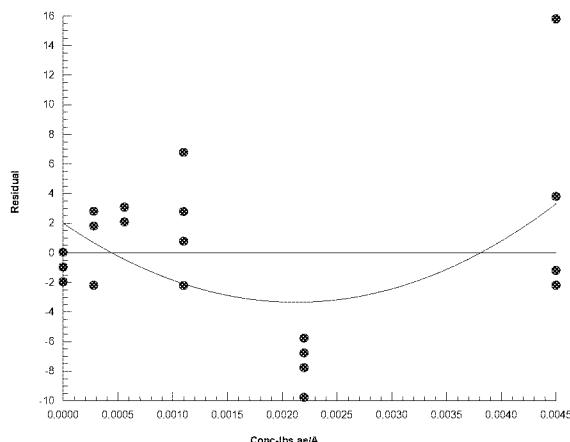
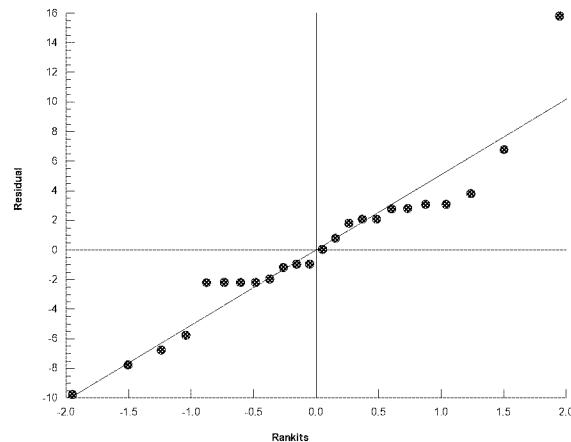
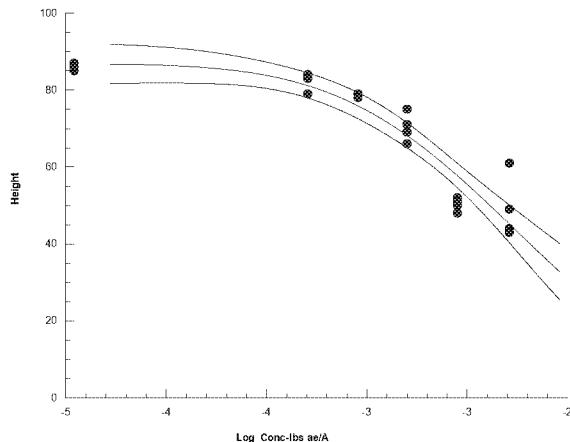
Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5

Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]



# CETIS Analytical Report

Report Date: 31 Mar-20 14:52 (p 1 of 3)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID: 18-6768-4671	Endpoint: Height			CETIS Version: CETISv1.9.5		
Analyzed: 31 Mar-20 14:51	Analysis: Nonparametric-Two Sample				Status Level: 1	
Batch ID: 16-9482-9811	Test Type: Vegetative Vigor Tier II				Analyst:	
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:	
Ending Date: 06 Nov-19	Species: Glycine max				Brine:	
Test Length: 107d 0h	Taxon:				Source: Age: V3	
Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.0003	0.00056	0.0004099		4.94%

## Mann-Whitney U Two-Sample Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision( $\alpha:5\%$ )
Negative Control		0.0003	11.5	n/a	2	6	Exact	0.2000	Non-Significant Effect
		0.00056*	15	n/a	1	6	Exact	0.0429	Significant Effect
		0.0012*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0024*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0048*	16	n/a	0	6	Exact	0.0143	Significant Effect

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	1.92	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Between	2147.38	429.475	5	101	<1.0E-37	Significant Effect
Error	76.25	4.23611	18			
Total	2223.62		23			

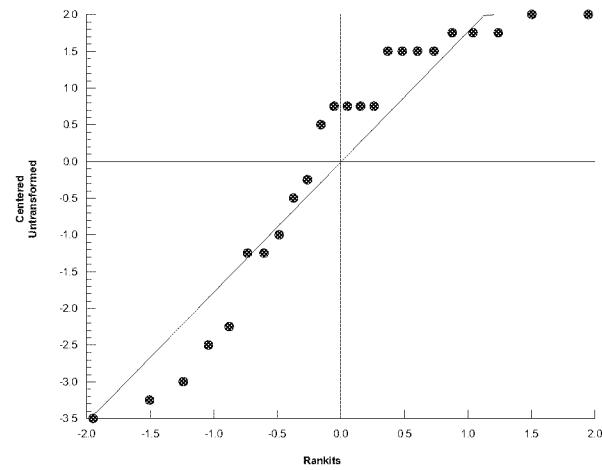
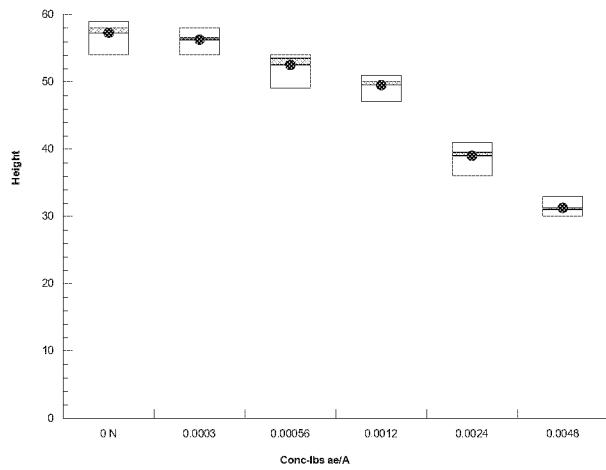
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:1\%$ )
Variance	Bartlett Equality of Variance Test	0.962	15.1	0.9656	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.876	0.884	0.0068	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	57.2	53.7	60.8	58	54	59	1.11	3.87%	0.00%
0.0003		4	56.2	53.5	59	56.5	54	58	0.854	3.04%	1.75%
0.00056		4	52.5	48.7	56.3	53.5	49	54	1.19	4.53%	8.30%
0.0012		4	49.5	46.5	52.5	50	47	51	0.957	3.87%	13.54%
0.0024		4	39	35.1	42.9	39.5	36	41	1.22	6.28%	31.88%
0.0048		4	31.2	28.9	33.6	31	30	33	0.75	4.80%	45.41%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:52 (p 2 of 3)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID:	13-0899-4996	Endpoint:	Height	CETIS Version:	CETISv1.9.5	
Analyzed:	31 Mar-20 14:51	Analysis:	Nonparametric-Control vs Ord. Treatments	Status Level:	1	
Batch ID:	16-9482-9811	Test Type:	Vegetative Vigor Tier II	Analyst:		
Start Date:	22 Jul-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:		
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:		
Test Length:	107d 0h	Taxon:		Source:	Age: V3	
Data Transform	Alt Hyp		NOEL	LOEL	TOEL	TU
Untransformed	C > T		0.0003	0.00056	0.0004099	

## Jonckheere-Terpstra Step-Down Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	Ties	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control		0.0003	1.04	1.64	2	Asymp	0.1487	Non-Significant Effect
		0.00056*	2.63	1.64	2	Asymp	0.0043	Significant Effect
		0.0012*	3.69	1.64	4	Asymp	1.1E-04	Significant Effect
		0.0024*	4.75	1.64	5	Asymp	1.0E-06	Significant Effect
		0.0048*	5.62	1.64	6	Asymp	<1.0E-37	Significant Effect

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	1.92	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	2147.38	429.475	5	101	<1.0E-37	Significant Effect
Error	76.25	4.23611	18			
Total	2223.62		23			

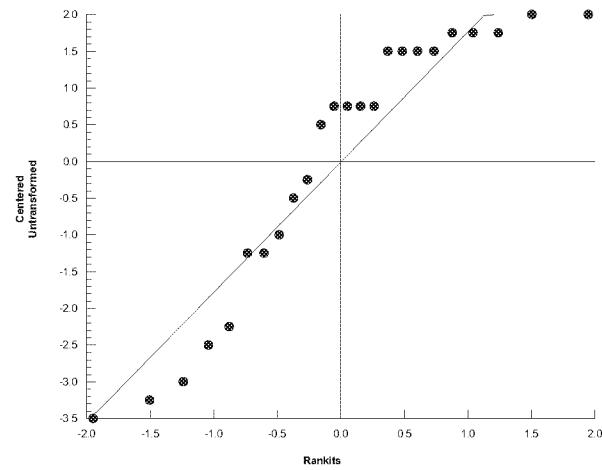
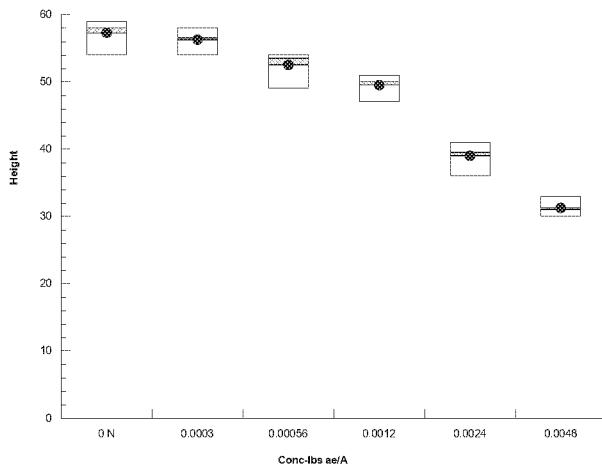
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	0.962	15.1	0.9656	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.876	0.884	0.0068	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	57.2	53.7	60.8	58	54	59	1.11	3.87%	0.00%
0.0003		4	56.2	53.5	59	56.5	54	58	0.854	3.04%	1.75%
0.00056		4	52.5	48.7	56.3	53.5	49	54	1.19	4.53%	8.30%
0.0012		4	49.5	46.5	52.5	50	47	51	0.957	3.87%	13.54%
0.0024		4	39	35.1	42.9	39.5	36	41	1.22	6.28%	31.88%
0.0048		4	31.2	28.9	33.6	31	30	33	0.75	4.80%	45.41%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:52 (p 3 of 3)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID:	00-6050-6194	Endpoint:	Weight	CETIS Version:	CETISv1.9.5	
Analyzed:	31 Mar-20 14:51	Analysis:	Parametric-Control vs Treatments	Status Level:	1	
Batch ID:	16-9482-9811	Test Type:	Vegetative Vigor Tier II	Analyst:		
Start Date:	22 Jul-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:		
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:		
Test Length:	107d 0h	Taxon:		Source:	Age: V3	
Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.0048	>0.0048	n/a		13.43%

## Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision( $\alpha:5\%$ )
Negative Control	0.0003	-0.423	2.41	527	6	CDF	0.9282	Non-Significant Effect	
	0.00056	0.864	2.41	527	6	CDF	0.4831	Non-Significant Effect	
	0.0012	-0.34	2.41	527	6	CDF	0.9141	Non-Significant Effect	
	0.0024	1.43	2.41	527	6	CDF	0.2495	Non-Significant Effect	
	0.0048	2.07	2.41	527	6	CDF	0.0929	Non-Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	1.77	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Between	997589	199518	5	2.08	0.1149	Non-Significant Effect
Error	1723950	95774.9	18			
Total	2721540		23			

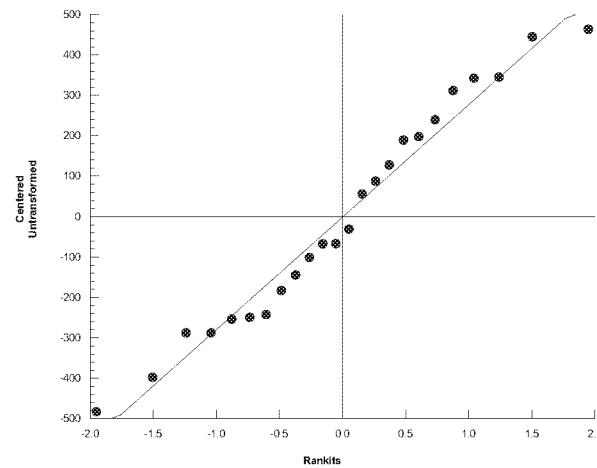
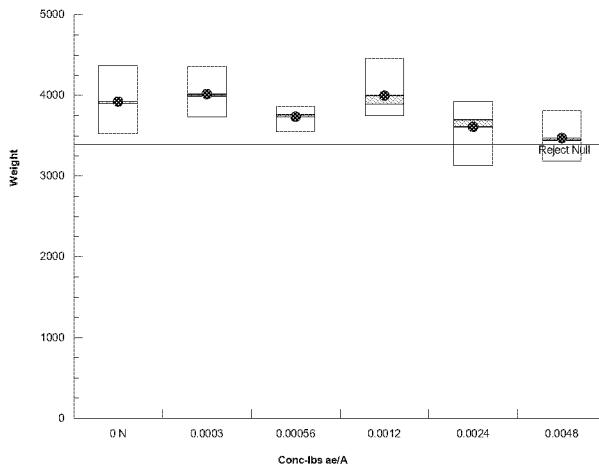
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:1\%$ )
Variance	Bartlett Equality of Variance Test	2.36	15.1	0.7981	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.961	0.884	0.4675	Normal Distribution

## Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	3920	3360	4480	3900	3520	4370	176	8.95%	0.00%
0.0003		4	4010	3520	4510	3990	3730	4360	157	7.81%	-2.36%
0.00056		4	3730	3510	3950	3760	3550	3860	69.9	3.74%	4.82%
0.0012		4	4000	3490	4500	3890	3750	4460	159	7.95%	-1.90%
0.0024		4	3610	3030	4180	3690	3120	3920	181	10.03%	8.01%
0.0048		4	3470	2960	3980	3440	3180	3810	160	9.20%	11.53%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:53 (p 1 of 4)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.	
Analysis ID: 08-1125-6781	Endpoint: Height			CETIS Version: CETISv1.9.5	
Analyzed: 31 Mar-20 14:51	Analysis: Nonlinear Regression (NLR)			Status Level: 1	
Batch ID: 16-9482-9811	Test Type: Vegetative Vigor Tier II			Analyst:	
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:	
Ending Date: 06 Nov-19	Species: Glycine max			Brine:	
Test Length: 107d 0h	Taxon:			Source:	Age: V3

## Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

## Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
4	-17.4	42	44.3	0.9517	3.40%	57.5	Yes	1.72	0.1986	Non-Significant Lack of Fit

## Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000428	0.000289	0.000564
IC10	0.000752	0.000594	0.000916
IC25	0.00193	0.00171	0.00216
IC50	0.00549	0.0047	0.00641

## Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	57.5	0.94	55.5	59.4	61.1	<1.0E-37	Significant Parameter
$\gamma$	1.55	0.147	1.24	1.86	10.5	<1.0E-37	Significant Parameter
$\delta$	0.00549	0.000406	0.00465	0.00634	13.5	<1.0E-37	Significant Parameter

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	56600	18900	3	4040	<1.0E-37	Significant
Lack of Fit	21.9	7.29	3	1.72	0.1986	Non-Significant
Pure Error	76.2	4.24	18			
Residual	98.1	4.67	21			

## Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.13	2.8	0.6222	No Outliers Detected
Variance	Bartlett Equality of Variance Test	0.962	11.1	0.9656	Equal Variances
	Mod Levene Equality of Variance	0.191	2.77	0.9623	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.784	2.49	0.0416	Non-Normal Distribution
	Shapiro-Wilk W Normality Test	0.921	0.917	0.0601	Normal Distribution

Height Summary				Calculated Variate					
Conc-lbs ae/A	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	57.2	54	59	1.11	2.22	3.87%	0.0%
0.0003		4	56.2	54	58	0.854	1.71	3.04%	1.75%
0.00056		4	52.5	49	54	1.19	2.38	4.53%	8.3%
0.0012		4	49.5	47	51	0.957	1.91	3.87%	13.5%
0.0024		4	39	36	41	1.22	2.45	6.28%	31.9%
0.0048		4	31.2	30	33	0.75	1.5	4.80%	45.4%

# CETIS Analytical Report

Report Date: 31 Mar-20 14:53 (p 2 of 4)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID: 08-1125-6781

Endpoint: Height

Analyzed: 31 Mar-20 14:51

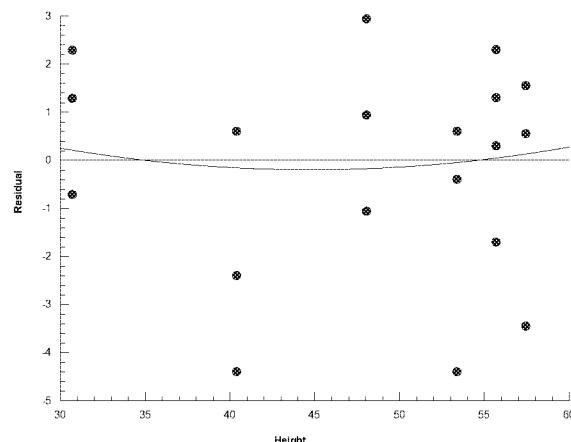
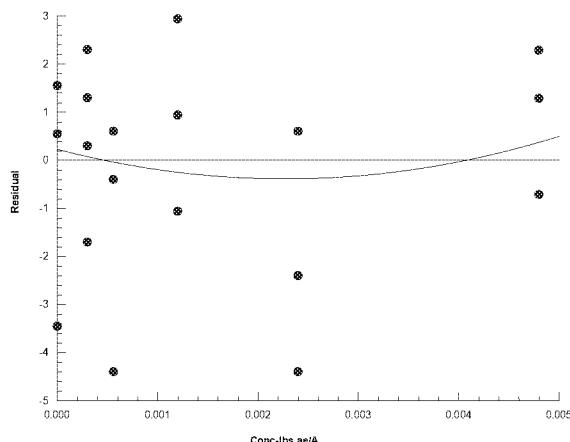
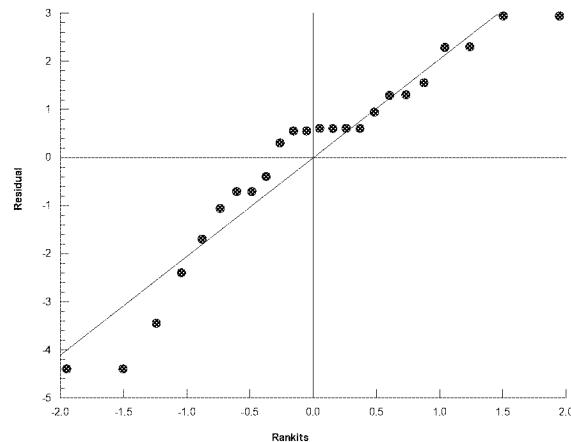
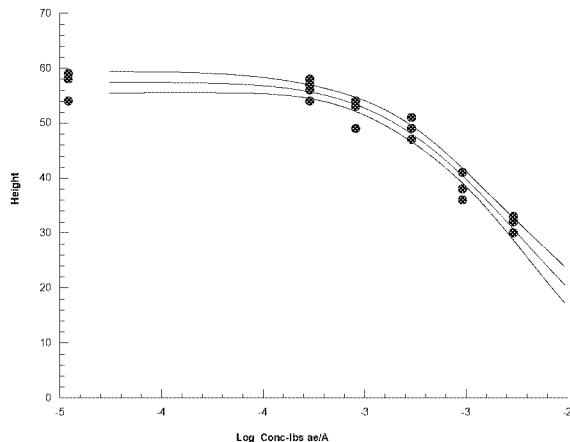
Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5

Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]



# CETIS Analytical Report

Report Date: 31 Mar-20 14:53 (p 3 of 4)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.	
Analysis ID: 05-2601-7863	Endpoint: Weight			CETIS Version: CETISv1.9.5	
Analyzed: 31 Mar-20 14:51	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 16-9482-9811	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 06 Nov-19	Species: Glycine max				Brine:
Test Length: 107d 0h	Taxon:				Source: Age: V3

## Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

## Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
5	-137	280	283	0.1906	6.16%	3940	Yes	1	0.4155	Non-Significant Lack of Fit

## Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.00202	n/a	0.00421
IC10	0.00385	0.00171	0.00636
IC25	0.0113	n/a	0.0502
IC50	0.0372	n/a	n/a

## Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	3940	117	3690	4180	33.7	<1.0E-37	Significant Parameter
$\gamma$	1.77	1.45	-1.24	4.78	1.22	0.2349	Non-Significant Parameter
$\delta$	0.0372	0.0641	-0.0961	0.171	0.581	0.5675	Non-Significant Parameter

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	345000000	115000000	3	1200	<1.0E-37	Significant
Lack of Fit	287000	95800	3	1	0.4155	Non-Significant
Pure Error	1720000	95800	18			
Residual	2010000	95800	21			

## Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.12	2.8	0.6490	No Outliers Detected
Variance	Bartlett Equality of Variance Test	2.36	11.1	0.7981	Equal Variances
	Mod Levene Equality of Variance	0.647	2.77	0.6677	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.235	2.49	0.8204	Normal Distribution
	Shapiro-Wilk W Normality Test	0.983	0.917	0.9504	Normal Distribution

			Calculated Variate						
Conc-lbs ae/A	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3920	3520	4370	176	351	8.95%	0.0%
0.0003		4	4010	3730	4360	157	313	7.81%	-2.36%
0.00056		4	3730	3550	3860	69.9	140	3.74%	4.82%
0.0012		4	4000	3750	4460	159	318	7.95%	-1.9%
0.0024		4	3610	3120	3920	181	362	10.00%	8.01%
0.0048		4	3470	3180	3810	160	319	9.20%	11.5%

# CETIS Analytical Report

Report Date: 31 Mar-20 14:53 (p 4 of 4)  
 Test Code/ID: 50958205 diveg / 08-5996-9857

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

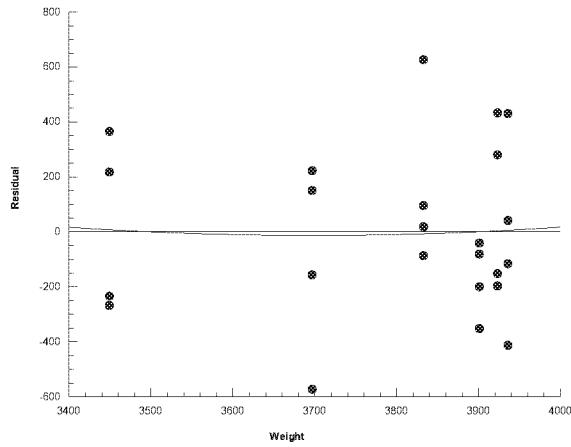
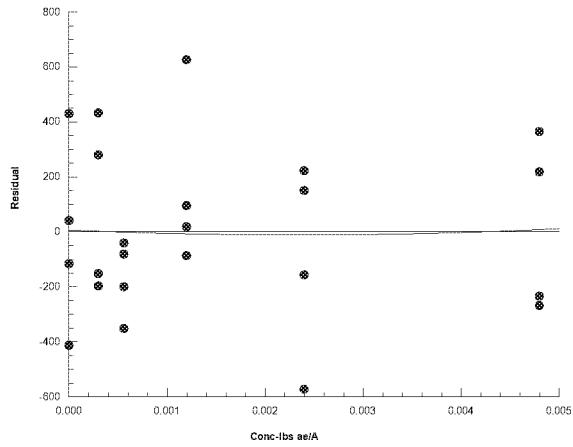
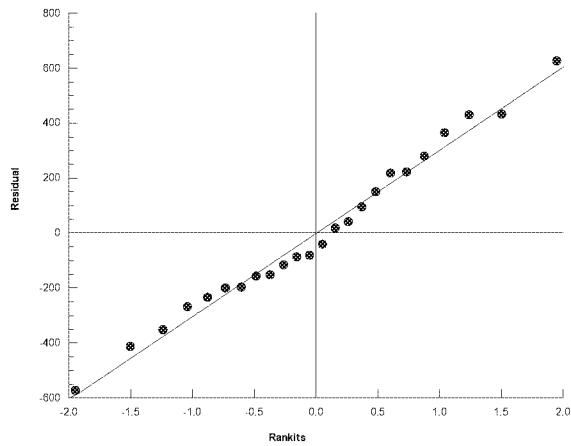
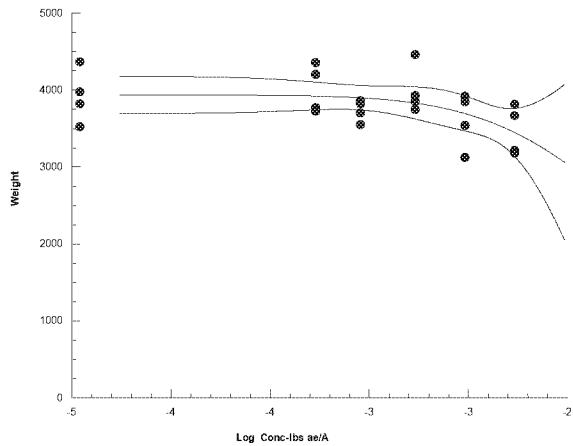
Analysis ID: 05-2601-7863  
 Analyzed: 31 Mar-20 14:51

Endpoint: Weight  
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5  
 Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]



# CETIS Summary Report

Report Date: 31 Mar-20 14:57 (p 1 of 2)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Batch ID:	14-9097-9550	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	91d 0h	Taxon:		Source:	Age: R1
Sample ID:	18-1969-2918	Code:	50958205glyrepr	Project:	
Sample Date:	07 Aug-19	Material:	Glyphosate	Source:	Syngenta Crop Protection LLC
Receipt Date:		CAS (PC):		Station:	
Sample Age:	n/a	Client:	CDM Smith - K. Bozicevich		

128931 50958205; Soybean yield- Reproductive Stage (R1)- Glyphosate treatment

### Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
08-2158-9937	Height	Jonckheere-Terpstra Step-Down Test	✓ <0.00058	0.00058	n/a		n/a	1
13-4841-5866	Height	Mann-Whitney U Two-Sample Test	✓ <0.00058	0.00058	n/a		6.3%	1
19-0354-7251	Weight	Dunnett Multiple Comparison Test	0.01	>0.01	n/a		18.1%	1

### Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
18-9012-6664	Height	NLR: 3P Cum Log-Normal (Probit)	IC5	0.000437	0.00014	0.000764		1
			IC10	0.000893	0.000541	0.0013		
			IC25	0.00295	0.00234	0.00365		
			IC50	0.0111	0.0083	0.0149		

### Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	86	84.7	87.3	85	87	0.408	0.816	0.95%	0.00%
0.00058		4	81.2	77.1	85.4	79	84	1.31	2.63	3.24%	5.52%
0.0011		4	78.5	77.6	79.4	78	79	0.289	0.577	0.74%	8.72%
0.0024		4	70.2	64.2	76.3	66	75	1.89	3.77	5.37%	18.31%
0.0049		4	50.2	47.5	53	48	52	0.854	1.71	3.40%	41.57%
0.01		4	49.2	36.1	62.4	43	61	4.13	8.26	16.77%	42.73%

### Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3370	2540	4200	2680	3940	261	522	15.50%	0.00%
0.00058		4	3480	2890	4070	3060	3800	185	370	10.63%	-3.43%
0.0011		4	3410	2850	3960	3010	3730	175	350	10.27%	-1.24%
0.0024		4	3710	3260	4170	3350	4050	142	284	7.66%	-10.35%
0.0049		4	3290	2980	3610	3010	3450	99.4	199	6.04%	2.17%
0.01		4	4020	3470	4560	3620	4410	170	341	8.49%	-19.31%

**CETIS Summary Report**Report Date: 31 Mar-20 14:57 (p 2 of 2)  
Test Code/ID: 50958205 glyrep / 19-0668-8104**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****Stone Environmental, Inc.****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	87	85	86	86
0.00058		79	84	83	79
0.0011		79	79	78	78
0.0024		75	66	71	69
0.0049		52	50	48	51
0.01		49	61	44	43

**Weight Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	3940	2680	3350	3500
0.00058		3280	3800	3790	3060
0.0011		3220	3730	3010	3670
0.0024		3350	3730	3720	4050
0.0049		3450	3310	3400	3010
0.01		3620	4150	3890	4410

# CETIS Summary Report

Report Date: 31 Mar-20 15:03 (p 1 of 2)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Batch ID:	12-7644-3626	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	22 Jul-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	107d 0h	Taxon:		Source:	Age: V3
Sample ID:	10-0055-1946	Code:	50958205glyveg	Project:	
Sample Date:	22 Jul-19	Material:	Glyphosate	Source:	Syngenta Crop Protection LLC
Receipt Date:		CAS (PC):		Station:	
Sample Age:	n/a	Client:	CDM Smith - K. Bozicevich		

128931 50958205; Soybean yield- Vegetative Growth Stage (V3); Glyphosate treatment

### Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓ NOEL	LOEL	TOEL	TU	PMSD	S
03-5322-6559	Height	Jonckheere-Terpstra Step-Down Test	✓ 0.0006	0.0011	0.0008124		n/a	1
16-0793-3733	Height	Mann-Whitney U Two-Sample Test	✓ 0.0006	0.0011	0.0008124		4.94%	1
04-2613-3137	Weight	Dunnett Multiple Comparison Test	0.01	>0.01	n/a		13.4%	1

### Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓ Level	Ibs ae/A	95% LCL	95% UCL	TU	S
15-8680-9984	Height	NLR: 3P Cum Log-Normal (Probit)	✓ IC5	0.000801	0.000524	0.00108		1
			✓ IC10	0.00144	0.00112	0.00177		
			✓ IC25	0.00383	0.00337	0.00432		
			✓ IC50	0.0113	0.00962	0.0134		
20-0384-7081	Weight	NLR: 3P Cum Log-Normal (Probit)	IC5	0.00399	n/a	0.00858		1
			IC10	0.00789	0.00333	0.0134		
			IC25	0.0247	n/a	0.118		
			IC50	0.0875	n/a	n/a		

### Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	57.2	53.7	60.8	54	59	1.11	2.22	3.87%	0.00%
0.0006		4	56.2	53.5	59	54	58	0.854	1.71	3.04%	1.75%
0.0011		4	52.5	48.7	56.3	49	54	1.19	2.38	4.53%	8.30%
0.0024		4	49.5	46.5	52.5	47	51	0.957	1.91	3.87%	13.54%
0.0047		4	39	35.1	42.9	36	41	1.22	2.45	6.28%	31.88%
0.01		4	31.2	28.9	33.6	30	33	0.75	1.5	4.80%	45.41%

### Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3920	3360	4480	3520	4370	176	351	8.95%	0.00%
0.0006		4	4010	3520	4510	3730	4360	157	313	7.81%	-2.36%
0.0011		4	3730	3510	3950	3550	3860	69.9	140	3.74%	4.82%
0.0024		4	4000	3490	4500	3750	4460	159	318	7.95%	-1.90%
0.0047		4	3610	3030	4180	3120	3920	181	362	10.03%	8.01%
0.01		4	3470	2960	3980	3180	3810	160	319	9.20%	11.53%

**CETIS Summary Report**Report Date: 31 Mar-20 15:03 (p 2 of 2)  
Test Code/ID: 50958205 glyveg / 06-1789-7415**OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)****Stone Environmental, Inc.****Height Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	54	58	58	59
0.0006		56	54	58	57
0.0011		49	53	54	54
0.0024		51	47	51	49
0.0047		38	36	41	41
0.01		32	33	30	30

**Weight Detail**

Conc-lbs ae/A	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	N	4370	3820	3520	3980
0.0006		4200	3770	4360	3730
0.0011		3860	3700	3820	3550
0.0024		3750	3850	3930	4460
0.0047		3120	3920	3850	3540
0.01		3670	3220	3810	3180

# CETIS Analytical Report

Report Date: 31 Mar-20 14:56 (p 1 of 3)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.	
Analysis ID: 13-4841-5866	Endpoint: Height	CETIS Version: CETISv1.9.5			
Analyzed: 31 Mar-20 14:55	Analysis: Nonparametric-Two Sample	Status Level: 1			
Batch ID: 14-9097-9550	Test Type: Vegetative Vigor Tier II	Analyst:			
Start Date: 07 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor	Diluent:			
Ending Date: 06 Nov-19	Species: Glycine max	Brine:			
Test Length: 91d 0h	Taxon:	Source:		Age: R1	
Data Transform	Alt Hyp	NOEL	LOEL	TOEL	
Untransformed	C > T	<0.00058	0.00058	n/a	6.30%

## Mann-Whitney U Two-Sample Test

Control	vs	Control II	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control		0.00058*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0011*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0024*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.0049*	16	n/a	0	6	Exact	0.0143	Significant Effect
		0.01*	16	n/a	0	6	Exact	0.0143	Significant Effect

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	3.37	2.8	0.0019	Outlier Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	5088.5	1017.7	5	65.4	<1.0E-37	Significant Effect
Error	280	15.5556	18			
Total	5368.5		23			

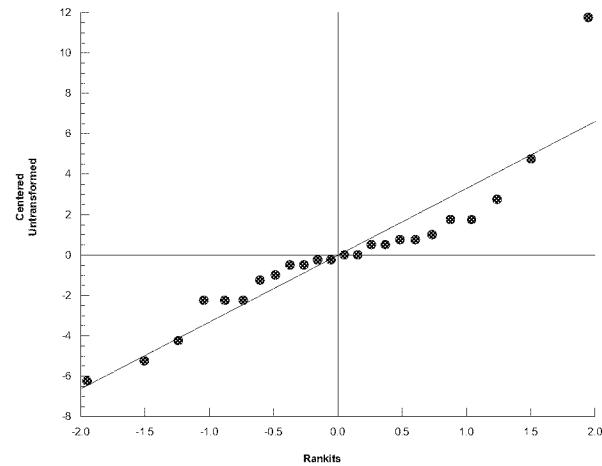
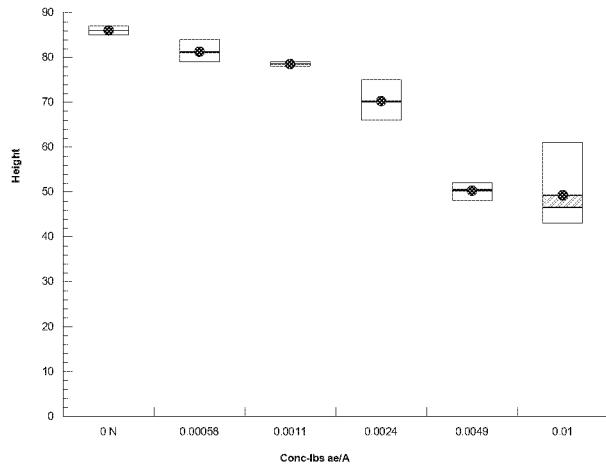
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	21.5	15.1	6.6E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.87	0.884	0.0052	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	86	84.7	87.3	86	85	87	0.408	0.95%	0.00%
0.00058		4	81.2	77.1	85.4	81	79	84	1.31	3.24%	5.52%
0.0011		4	78.5	77.6	79.4	78.5	78	79	0.289	0.74%	8.72%
0.0024		4	70.2	64.2	76.3	70	66	75	1.89	5.37%	18.31%
0.0049		4	50.2	47.5	53	50.5	48	52	0.854	3.40%	41.57%
0.01		4	49.2	36.1	62.4	46.5	43	61	4.13	16.77%	42.73%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:56 (p 2 of 3)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID:	08-2158-9937	Endpoint:	Height	CETIS Version:	CETISv1.9.5	
Analyzed:	31 Mar-20 14:55	Analysis:	Nonparametric-Control vs Ord. Treatments	Status Level:	1	
Batch ID:	14-9097-9550	Test Type:	Vegetative Vigor Tier II	Analyst:		
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:		
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:		
Test Length:	91d 0h	Taxon:		Source:	Age: R1	
Data Transform	Alt Hyp		NOEL	LOEL	TOEL	TU
Untransformed	C > T		<0.00058	0.00058	n/a	

## Jonckheere-Terpstra Step-Down Test

Control	vs	Control II	Test Stat	Critical	Ties	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control	0.00058*	2.34	1.64	2	Asymp	0.0097	Significant Effect	
	0.0011*	3.29	1.64	3	Asymp	4.9E-04	Significant Effect	
	0.0024*	4.34	1.64	3	Asymp	7.2E-06	Significant Effect	
	0.0049*	5.21	1.64	3	Asymp	<1.0E-37	Significant Effect	
	0.01*	5.72	1.64	3	Asymp	<1.0E-37	Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	3.37	2.8	0.0019	Outlier Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	5088.5	1017.7	5	65.4	<1.0E-37	Significant Effect
Error	280	15.5556	18			
Total	5368.5		23			

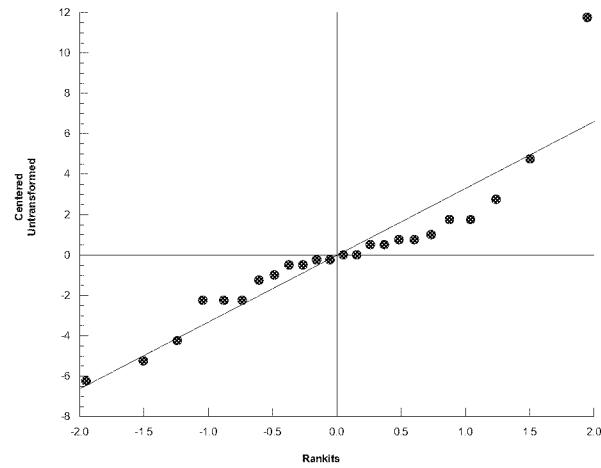
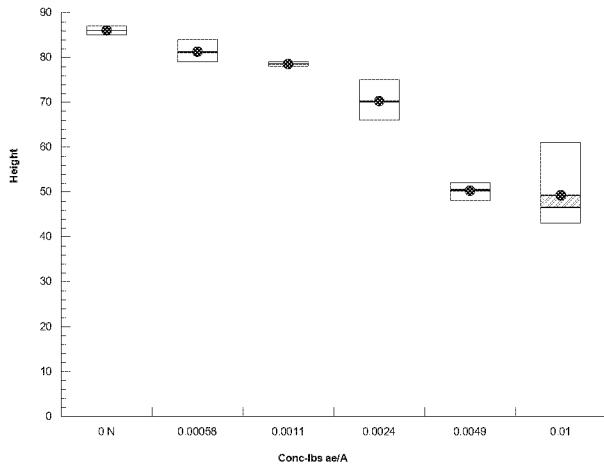
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	21.5	15.1	6.6E-04	Unequal Variances
Distribution	Shapiro-Wilk W Normality Test	0.87	0.884	0.0052	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	86	84.7	87.3	86	85	87	0.408	0.95%	0.00%
0.00058		4	81.2	77.1	85.4	81	79	84	1.31	3.24%	5.52%
0.0011		4	78.5	77.6	79.4	78.5	78	79	0.289	0.74%	8.72%
0.0024		4	70.2	64.2	76.3	70	66	75	1.89	5.37%	18.31%
0.0049		4	50.2	47.5	53	50.5	48	52	0.854	3.40%	41.57%
0.01		4	49.2	36.1	62.4	46.5	43	61	4.13	16.77%	42.73%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:56 (p 3 of 3)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID: 19-0354-7251	Endpoint: Weight			CETIS Version: CETISv1.9.5		
Analyzed: 31 Mar-20 14:55	Analysis: Parametric-Control vs Treatments			Status Level: 1		
Batch ID: 14-9097-9550	Test Type: Vegetative Vigor Tier II			Analyst:		
Start Date: 07 Aug-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:		
Ending Date: 06 Nov-19	Species: Glycine max			Brine:		
Test Length: 91d 0h	Taxon:			Source:	Age: R1	
Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.01	>0.01	n/a		18.10%

## Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision( $\alpha:5\%$ )
Negative Control	0.00058	-0.456	2.41	609	6	CDF	0.9334	Non-Significant Effect	
	0.0011	-0.165	2.41	609	6	CDF	0.8773	Non-Significant Effect	
	0.0024	-1.38	2.41	609	6	CDF	0.9940	Non-Significant Effect	
	0.0049	0.288	2.41	609	6	CDF	0.7347	Non-Significant Effect	
	0.01	-2.57	2.41	609	6	CDF	0.9999	Non-Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.17	2.8	0.5472	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Between	1475560	295111	5	2.3	0.0876	Non-Significant Effect
Error	2305300	128072	18			
Total	3780860		23			

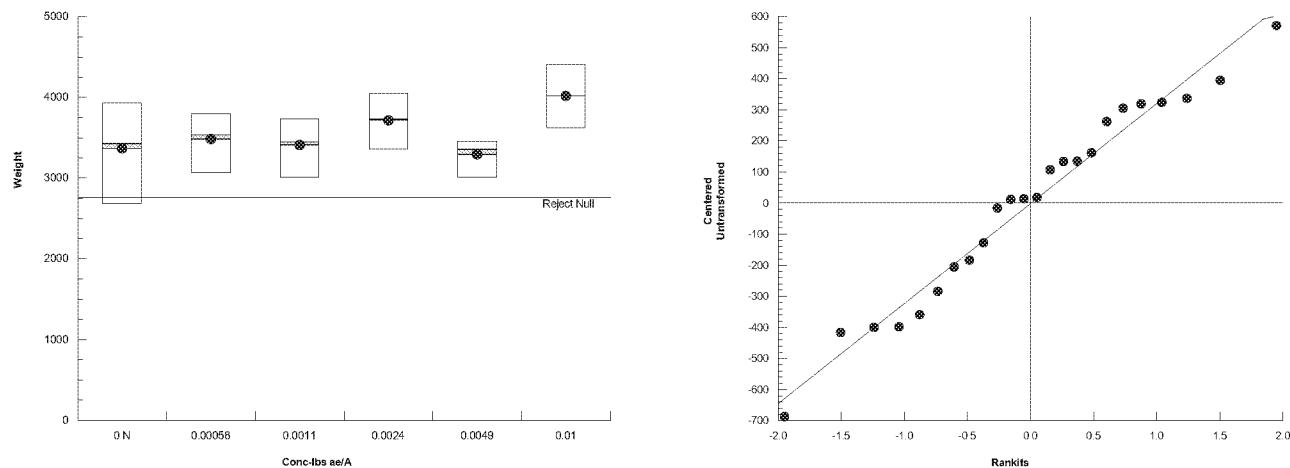
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:1\%$ )
Variance	Bartlett Equality of Variance Test	2.53	15.1	0.7715	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.97	0.884	0.6633	Normal Distribution

## Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	3370	2540	4200	3420	2680	3940	261	15.50%	0.00%
0.00058		4	3480	2890	4070	3530	3060	3800	185	10.63%	-3.43%
0.0011		4	3410	2850	3960	3450	3010	3730	175	10.27%	-1.24%
0.0024		4	3710	3260	4170	3730	3350	4050	142	7.66%	-10.35%
0.0049		4	3290	2980	3610	3350	3010	3450	99.4	6.04%	2.17%
0.01		4	4020	3470	4560	4020	3620	4410	170	8.49%	-19.31%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 14:56 (p 1 of 2)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID:	18-9012-6664	Endpoint:	Height	CETIS Version:	CETISv1.9.5
Analyzed:	31 Mar-20 14:55	Analysis:	Nonlinear Regression (NLR)	Status Level:	1
Batch ID:	14-9097-9550	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	07 Aug-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	91d 0h	Taxon:		Source:	Age: R1

### Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

### Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
7	-39	85.1	87.5	0.8793	6.03%	86.9	Yes	6.67	0.0032	Significant Lack of Fit

### Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000437	0.00014	0.000764
IC10	0.000893	0.000541	0.0013
IC25	0.00295	0.00234	0.00365
IC50	0.0111	0.0083	0.0149

### Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	86.9	2.52	81.7	92.2	34.5	<1.0E-37	Significant Parameter
$\gamma$	1.97	0.28	1.39	2.55	7.02	6.2E-07	Significant Parameter
$\delta$	0.0111	0.00162	0.00775	0.0145	6.86	8.8E-07	Significant Parameter

### ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	120000	40000	3	1420	<1.0E-37	Significant
Lack of Fit	311	104	3	6.67	0.0032	Significant
Pure Error	280	15.6	18			
Residual	591	28.2	21			

### Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	3.09	2.8	0.0113	Outlier Detected
Variance	Bartlett Equality of Variance Test	21.5	11.1	6.6E-04	Unequal Variances
	Mod Levene Equality of Variance	2.35	2.77	0.0828	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.721	2.49	0.0600	Normal Distribution
	Shapiro-Wilk W Normality Test	0.919	0.917	0.0544	Normal Distribution

### Height Summary

Conc-lbs ae/A	Code	Count	Calculated Variate						
			Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	86	85	87	0.408	0.816	0.95%	0.0%
0.00058		4	81.2	79	84	1.31	2.63	3.24%	5.52%
0.0011		4	78.5	78	79	0.289	0.577	0.74%	8.72%
0.0024		4	70.2	66	75	1.89	3.77	5.37%	18.3%
0.0049		4	50.2	48	52	0.854	1.71	3.40%	41.6%
0.01		4	49.2	43	61	4.13	8.26	16.80%	42.7%

# CETIS Analytical Report

Report Date: 31 Mar-20 14:56 (p 2 of 2)  
 Test Code/ID: 50958205 glyrep / 19-0668-8104

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

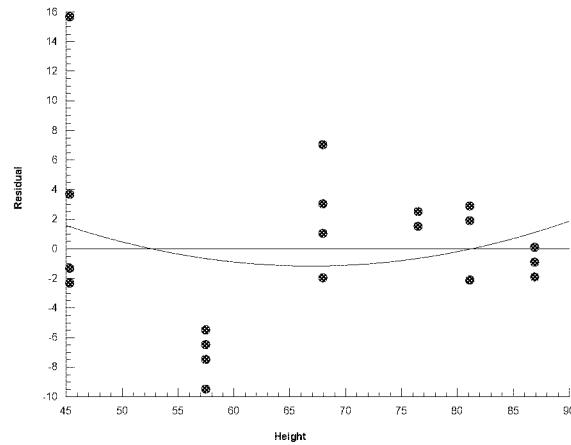
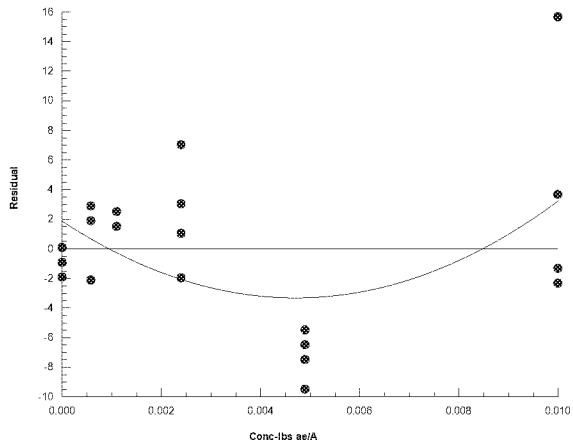
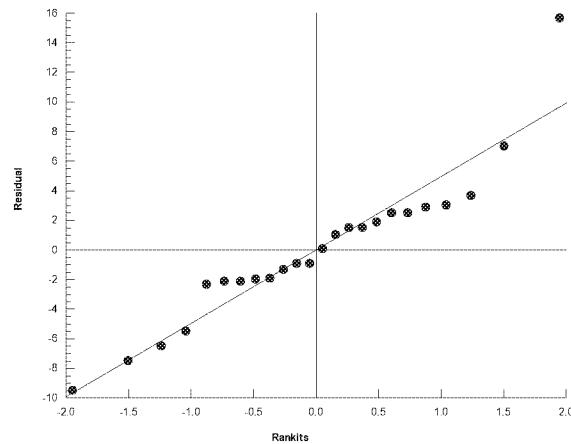
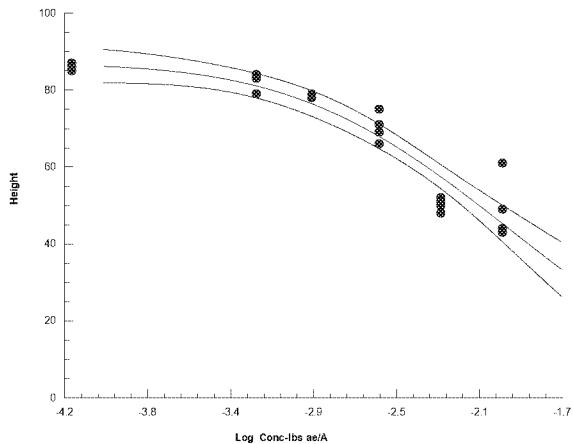
Analysis ID: 18-9012-6664  
 Analyzed: 31 Mar-20 14:55

Endpoint: Height  
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5  
 Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]



# CETIS Analytical Report

Report Date: 31 Mar-20 15:01 (p 1 of 3)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.				
Analysis ID: 16-0793-3733	Endpoint: Height			CETIS Version: CETISv1.9.5				
Analyzed: 31 Mar-20 14:59	Analysis: Nonparametric-Two Sample			Status Level: 1				
Batch ID: 12-7644-3626	Test Type: Vegetative Vigor Tier II			Analyst:				
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor			Diluent:				
Ending Date: 06 Nov-19	Species: Glycine max			Brine:				
Test Length: 107d 0h	Taxon:			Source:	Age: V3			
Data Transform	Alt Hyp			NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T			0.0006	0.0011	0.0008124		4.94%

## Mann-Whitney U Two-Sample Test

Control	vs	Conc-lbs ae/A	Test Stat	Critical	Ties	DF	P-Type	P-Value	Decision( $\alpha:5\%$ )
Negative Control	0.0006	11.5	n/a	2	6	Exact	0.2000	Non-Significant Effect	
	0.0011*	15	n/a	1	6	Exact	0.0429	Significant Effect	
	0.0024*	16	n/a	0	6	Exact	0.0143	Significant Effect	
	0.0047*	16	n/a	0	6	Exact	0.0143	Significant Effect	
	0.01*	16	n/a	0	6	Exact	0.0143	Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	1.92	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Between	2147.38	429.475	5	101	<1.0E-37	Significant Effect
Error	76.25	4.23611	18			
Total	2223.62		23			

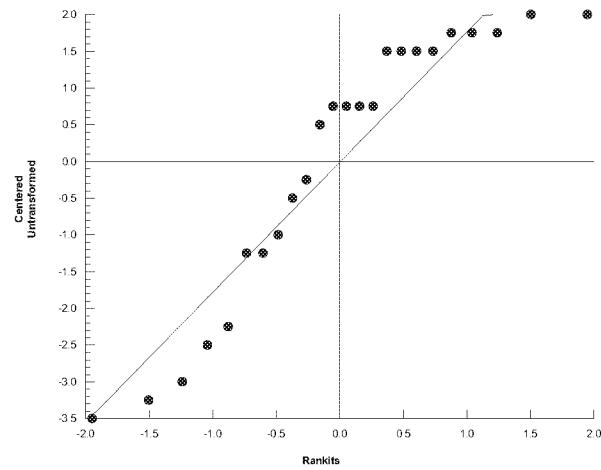
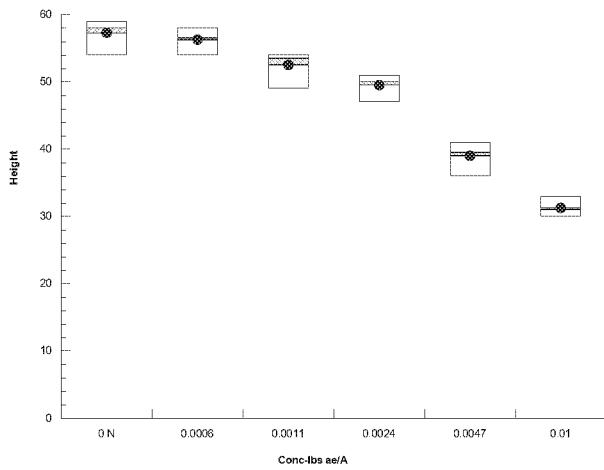
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha:1\%$ )
Variance	Bartlett Equality of Variance Test	0.962	15.1	0.9656	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.876	0.884	0.0068	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	57.2	53.7	60.8	58	54	59	1.11	3.87%	0.00%
0.0006		4	56.2	53.5	59	56.5	54	58	0.854	3.04%	1.75%
0.0011		4	52.5	48.7	56.3	53.5	49	54	1.19	4.53%	8.30%
0.0024		4	49.5	46.5	52.5	50	47	51	0.957	3.87%	13.54%
0.0047		4	39	35.1	42.9	39.5	36	41	1.22	6.28%	31.88%
0.01		4	31.2	28.9	33.6	31	30	33	0.75	4.80%	45.41%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 15:01 (p 2 of 3)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID:	03-5322-6559	Endpoint:	Height	CETIS Version:	CETISv1.9.5
Analyzed:	31 Mar-20 14:59	Analysis:	Nonparametric-Control vs Ord. Treatments	Status Level:	1
Batch ID:	12-7644-3626	Test Type:	Vegetative Vigor Tier II	Analyst:	
Start Date:	22 Jul-19	Protocol:	OCSPP 850.4150 Plant Vegetative Vigor	Diluent:	
Ending Date:	06 Nov-19	Species:	Glycine max	Brine:	
Test Length:	107d 0h	Taxon:		Source:	Age: V3

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU
Untransformed	C > T	0.0006	0.0011	0.0008124	

## Jonckheere-Terpstra Step-Down Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	Ties	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control		0.0006	1.04	1.64	2	Asymp	0.1487	Non-Significant Effect
		0.0011*	2.63	1.64	2	Asymp	0.0043	Significant Effect
		0.0024*	3.69	1.64	4	Asymp	1.1E-04	Significant Effect
		0.0047*	4.75	1.64	5	Asymp	1.0E-06	Significant Effect
		0.01*	5.62	1.64	6	Asymp	<1.0E-37	Significant Effect

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	1.92	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	2147.38	429.475	5	101	<1.0E-37	Significant Effect
Error	76.25	4.23611	18			
Total	2223.62		23			

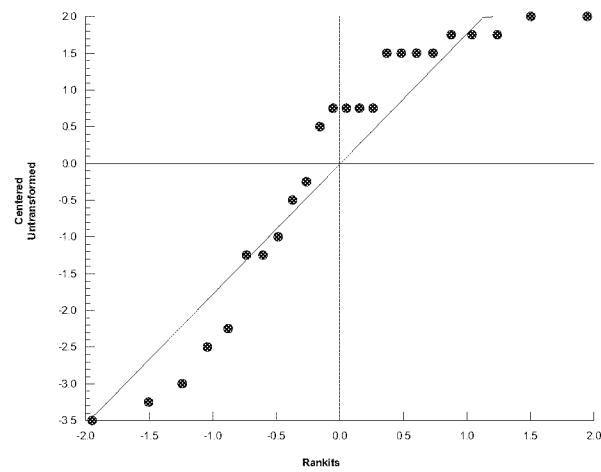
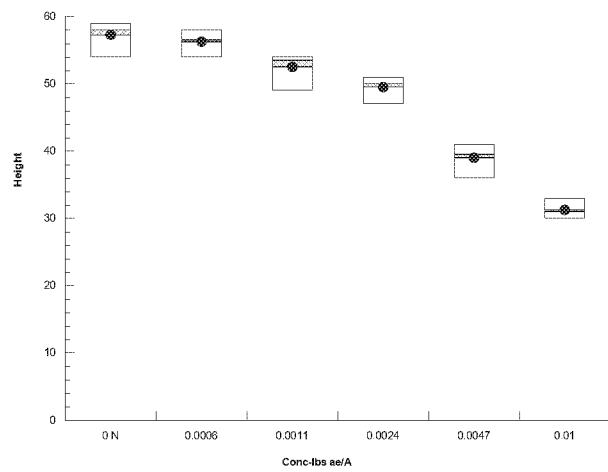
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	0.962	15.1	0.9656	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.876	0.884	0.0068	Non-Normal Distribution

## Height Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	57.2	53.7	60.8	58	54	59	1.11	3.87%	0.00%
0.0006		4	56.2	53.5	59	56.5	54	58	0.854	3.04%	1.75%
0.0011		4	52.5	48.7	56.3	53.5	49	54	1.19	4.53%	8.30%
0.0024		4	49.5	46.5	52.5	50	47	51	0.957	3.87%	13.54%
0.0047		4	39	35.1	42.9	39.5	36	41	1.22	6.28%	31.88%
0.01		4	31.2	28.9	33.6	31	30	33	0.75	4.80%	45.41%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 15:01 (p 3 of 3)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.		
Analysis ID: 04-2613-3137	Endpoint: Weight	CETIS Version: CETISv1.9.5				
Analyzed: 31 Mar-20 14:59	Analysis: Parametric-Control vs Treatments	Status Level: 1				
Batch ID: 12-7644-3626	Test Type: Vegetative Vigor Tier II	Analyst:				
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor	Diluent:				
Ending Date: 06 Nov-19	Species: Glycine max	Brine:				
Test Length: 107d 0h	Taxon:	Source:		Age: V3		
Data Transform	Alt Hyp	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	C > T	0.01	>0.01	n/a		13.43%

## Dunnett Multiple Comparison Test

Control	vs	Conc-lbs ae/	Test Stat	Critical	MSD	DF	P-Type	P-Value	Decision( $\alpha$ :5%)
Negative Control	0.0006	-0.423	2.41	527	6	CDF	0.9282	Non-Significant Effect	
	0.0011	0.864	2.41	527	6	CDF	0.4831	Non-Significant Effect	
	0.0024	-0.34	2.41	527	6	CDF	0.9141	Non-Significant Effect	
	0.0047	1.43	2.41	527	6	CDF	0.2495	Non-Significant Effect	
	0.01	2.07	2.41	527	6	CDF	0.0929	Non-Significant Effect	

## Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :5%)
Outlier	Grubbs Extreme Value Test	1.77	2.8	1.0000	No Outliers Detected

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha$ :5%)
Between	997589	199518	5	2.08	0.1149	Non-Significant Effect
Error	1723950	95774.9	18			
Total	2721540		23			

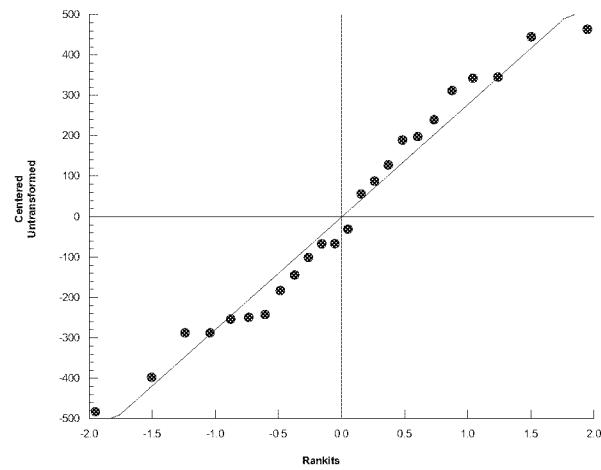
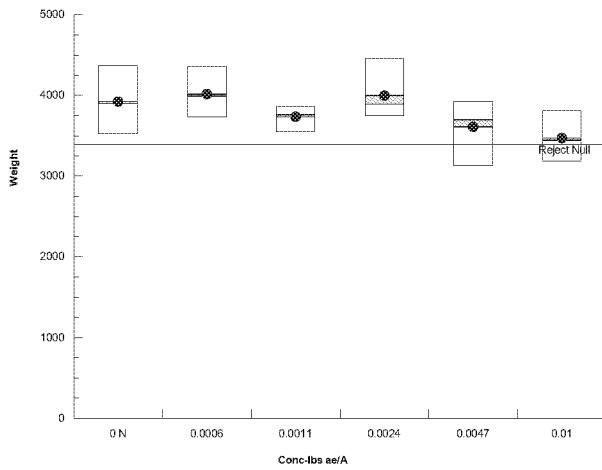
## ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision( $\alpha$ :1%)
Variance	Bartlett Equality of Variance Test	2.36	15.1	0.7981	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.961	0.884	0.4675	Normal Distribution

## Weight Summary

Conc-lbs ae/A	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	N	4	3920	3360	4480	3900	3520	4370	176	8.95%	0.00%
0.0006		4	4010	3520	4510	3990	3730	4360	157	7.81%	-2.36%
0.0011		4	3730	3510	3950	3760	3550	3860	69.9	3.74%	4.82%
0.0024		4	4000	3490	4500	3890	3750	4460	159	7.95%	-1.90%
0.0047		4	3610	3030	4180	3690	3120	3920	181	10.03%	8.01%
0.01		4	3470	2960	3980	3440	3180	3810	160	9.20%	11.53%

## Graphics



# CETIS Analytical Report

Report Date: 31 Mar-20 15:02 (p 1 of 4)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.	
Analysis ID: 15-8680-9984	Endpoint: Height			CETIS Version: CETISv1.9.5	
Analyzed: 31 Mar-20 14:59	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 12-7644-3626	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 06 Nov-19	Species: Glycine max				Brine:
Test Length: 107d 0h	Taxon:				Source: Age: V3

## Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha - [1 - \Phi(\log[x/\delta]/\gamma)]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

## Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
4	-18.2	43.6	46	0.9483	3.55%	57.6	Yes	2.25	0.1169	Non-Significant Lack of Fit

## Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.000801	0.000524	0.00108
IC10	0.00144	0.00112	0.00177
IC25	0.00383	0.00337	0.00432
IC50	0.0113	0.00962	0.0134

## Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	57.6	0.984	55.5	59.6	58.5	<1.0E-37	Significant Parameter
$\gamma$	1.61	0.155	1.29	1.93	10.4	<1.0E-37	Significant Parameter
$\delta$	0.0113	0.000899	0.00948	0.0132	12.6	<1.0E-37	Significant Parameter

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	56600	18900	3	3770	<1.0E-37	Significant
Lack of Fit	28.7	9.55	3	2.25	0.1169	Non-Significant
Pure Error	76.2	4.24	18			
Residual	105	5	21			

## Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.22	2.8	0.4705	No Outliers Detected
Variance	Bartlett Equality of Variance Test	0.962	11.1	0.9656	Equal Variances
	Mod Levene Equality of Variance	0.191	2.77	0.9623	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.723	2.49	0.0590	Normal Distribution
	Shapiro-Wilk W Normality Test	0.927	0.917	0.0848	Normal Distribution

Height Summary				Calculated Variate					
Conc-lbs ae/A	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	57.2	54	59	1.11	2.22	3.87%	0.0%
0.0006		4	56.2	54	58	0.854	1.71	3.04%	1.75%
0.0011		4	52.5	49	54	1.19	2.38	4.53%	8.3%
0.0024		4	49.5	47	51	0.957	1.91	3.87%	13.5%
0.0047		4	39	36	41	1.22	2.45	6.28%	31.9%
0.01		4	31.2	30	33	0.75	1.5	4.80%	45.4%

# CETIS Analytical Report

Report Date: 31 Mar-20 15:02 (p 2 of 4)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

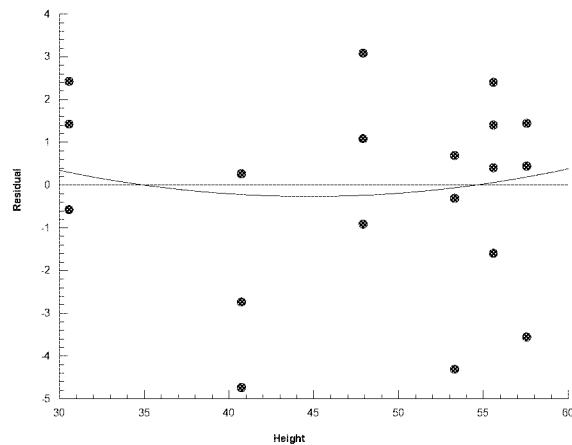
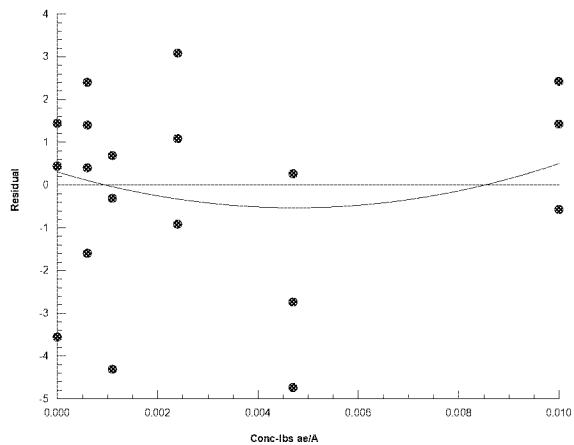
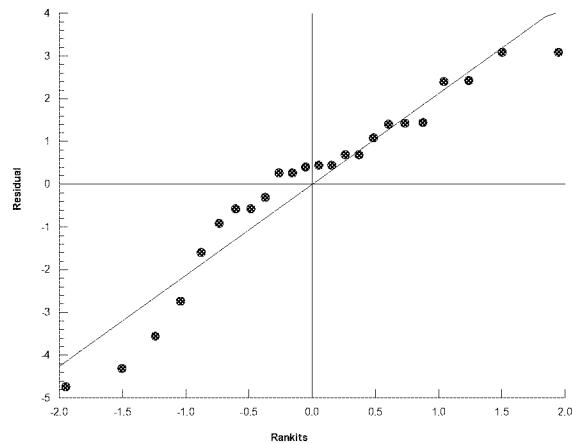
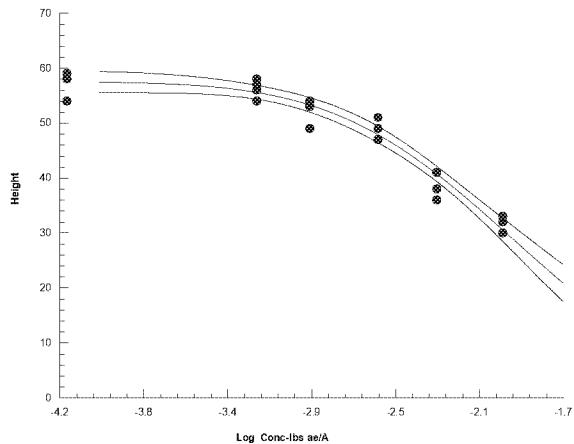
Analysis ID: 15-8680-9984  
 Analyzed: 31 Mar-20 14:59

Endpoint: Height  
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5  
 Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]



# CETIS Analytical Report

Report Date: 31 Mar-20 15:02 (p 3 of 4)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)				Stone Environmental, Inc.	
Analysis ID: 20-0384-7081	Endpoint: Weight			CETIS Version: CETISv1.9.5	
Analyzed: 31 Mar-20 14:59	Analysis: Nonlinear Regression (NLR)				Status Level: 1
Batch ID: 12-7644-3626	Test Type: Vegetative Vigor Tier II				Analyst:
Start Date: 22 Jul-19	Protocol: OCSPP 850.4150 Plant Vegetative Vigor				Diluent:
Ending Date: 06 Nov-19	Species: Glycine max				Brine:
Test Length: 107d 0h	Taxon:				Source: Age: V3

## Non-Linear Regression Options

Model Name and Function	Weighting Function	PTBS Function	X Trans	Y Trans
3P Cum Log-Normal (Probit): $\mu = \alpha [1 - \Phi[\log[x/\delta]/\gamma]]$	Normal [ $\omega=1$ ]	Off [ $\mu^*=\mu$ ]	None	None

## Regression Summary

Iters	Log LL	AICc	BIC	Adj R2	PMSE	Thresh	Optimize	F Stat	P-Value	Decision( $\alpha:5\%$ )
6	-137	280	283	0.1873	6.33%	3940	Yes	1.03	0.4035	Non-Significant Lack of Fit

## Point Estimates

Level	Ibs ae/A	95% LCL	95% UCL
IC5	0.00399	n/a	0.00858
IC10	0.00789	0.00333	0.0134
IC25	0.0247	n/a	0.118
IC50	0.0875	n/a	n/a

## Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision( $\alpha:5\%$ )
$\alpha$	3940	120	3690	4190	32.9	<1.0E-37	Significant Parameter
$\gamma$	1.88	1.52	-1.29	5.04	1.23	0.2308	Non-Significant Parameter
$\delta$	0.0875	0.157	-0.24	0.415	0.556	0.5844	Non-Significant Parameter

## ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision( $\alpha:5\%$ )
Model	345000000	115000000	3	1200	<1.0E-37	Significant
Lack of Fit	295000	98500	3	1.03	0.4035	Non-Significant
Pure Error	1720000	95800	18			
Residual	2020000	96200	21			

## Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision( $\alpha:5\%$ )
Outlier	Grubbs Extreme Value Test	2.13	2.8	0.6293	No Outliers Detected
Variance	Bartlett Equality of Variance Test	2.36	11.1	0.7981	Equal Variances
	Mod Levene Equality of Variance	0.647	2.77	0.6677	Equal Variances
Distribution	Anderson-Darling A2 Normality Test	0.225	2.49	0.8536	Normal Distribution
	Shapiro-Wilk W Normality Test	0.985	0.917	0.9630	Normal Distribution

			Calculated Variate						
Conc-Ibs ae/A	Code	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	N	4	3920	3520	4370	176	351	8.95%	0.0%
0.0006		4	4010	3730	4360	157	313	7.81%	-2.36%
0.0011		4	3730	3550	3860	69.9	140	3.74%	4.82%
0.0024		4	4000	3750	4460	159	318	7.95%	-1.9%
0.0047		4	3610	3120	3920	181	362	10.00%	8.01%
0.01		4	3470	3180	3810	160	319	9.20%	11.5%

# CETIS Analytical Report

Report Date: 31 Mar-20 15:02 (p 4 of 4)  
 Test Code/ID: 50958205 glyveg / 06-1789-7415

## OCSPP 850.4150 Terrestrial Plant Tier II (Vegetative Vigor)

Stone Environmental, Inc.

Analysis ID: 20-0384-7081  
 Analyzed: 31 Mar-20 14:59

Endpoint: Weight  
 Analysis: Nonlinear Regression (NLR)

CETIS Version: CETISv1.9.5  
 Status Level: 1

### Graphics

Model: 3P Cum Log-Normal (Probit):  $\mu = \alpha \cdot [1 - \Phi[\log[x/\delta]/\gamma]]$  Distribution: Normal [ $\omega=1$ ]

